Solving QP problems by penalization and smoothing

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Abstract

In this paper we describe a new technique for solving QP problems with general linear constraints. It is intended to solve very large scale problems, where active set methods become impractical. It solves the problems iteratively, and, of course, approximately only. There are known lots of methods of this type. However, the successful ones known so far either deal with bound constrained problems only or belong to the class of interior point methods. The latter are quite successful in the convex case but get trouble otherwise. Contrary, the method used here is able to deal with nonconvex cases and aims in finding a point satisfying the second order necessary optimality conditions. It works without using a modification of the Hessian. It is based on the well known exact l1-penalty function, smoothing of abs(.) and min(.) and solving the resulting unconstrained or bound constrained problem by a variant of the Lanczos method.

Keywords: QP, inexact Newton method, exact penalty function, smoothing, Lanczos

AMS(MOS) classification 90C30, 65K05

1 Introduction

We describe an algorithm aiming at solving the general QP problem

$$\begin{aligned} \text{Minimize} f(x) &= \tfrac{1}{2}x^TAx - b^Tx,\ A \ = \ A^T \text{ general} \\ \text{subject to } h(x) &= H^Tx + h^0 \ = \ 0, \\ g(x) &= G^Tx + g^0 \ \geq \ 0 \ , \\ x_{\mathcal{J}} &\geq \ 0 \ . \end{aligned}$$

Here $\mathcal{J}$ is a possibly empty subset of $\{1, \ldots, n\}$. It is well known that solving a nonconvex QP to optimality is NP hard , even checking for optimality is so, [12]. Therefore we confine us to identify second order necessary points of the problem. For solving QP's a lot of methods with quite different

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approaches is known. The paper [14] contains an overview regarding methods aiming in treating the large scale case. Whereas the merely bound constrained case can be treated successfully by a variety of methods this is far from being true for the case with general linear constraints. The paper [14] describes three approaches to reduce this general case to the bound constrained one. Finally all these show little success, since they essentially square the condition number of the Jacobian of underlying Kuhn Tucker system. For positive semidefinite A one could, after introducing positive slacks for the general linear inequalities, use interior point methods combined with gradient projection [14]. But this would be costly with many such constraints. Moreover the interior point approach runs into considerable trouble as soon as A losses semidefiniteness. Here we aim in developing a purely primal method which needs no artificial variables, does not deteriorate the conditioning of the problem and is applicable in the nonconvex case. To this end we use exact penalization as our entry point. The nonsmooth exact penalty function is then smoothed and the smoothed problem solved by an inexact Newton method based on the Lanczos method, including directions of negative curvature. Unlike other authors [11], [9] we use accurate eigenvector information for this task. In addition , rather than constructing a nonlinear arc of descent we use independent moves in several directions within each single minimization step.

For the theoretical treatment of the problem via an exact penalty function we assume that H is of full rank and that there exists a Slater point, i.e. a point x^0 satisfying

$$h(x^0) = 0 \, , \; g(x^0) > 0 \, , x^0_{\mathcal{J}} > 0.$$

This implies that for every boundary point of the feasible set and for every infeasible point the modified extended condition of Mangasarian-Fromowitz holds:

$$\exists \; z = \hat{x} - x \;\text{ such that }\; H^T z = -h(x) \; , \quad G^T_{\mathcal{A}\cup\mathcal{V}} z > 0 \; , \; z_i > 0 \text{ if } x_i \leq 0 \; .$$

where

$$\mathcal{A} = \{ i : \; g_i(x) = 0 \; \} \; , \mathcal{V} = \{ i : \; g_i(x) < 0 \; \} \; .$$

This in turn means that for sufficiently large penalty weight the penalty function can be decreased in the direction z and the problem can be solved by an exact penalty function approach [1]. That means that every strong local minimizer of

$$\Phi(x;\beta) = f(x) + \beta(||h(x)||_1 + ||(g(x))^-||_1) \text{ subject to } x_{\mathcal{J}} \geq 0 \; .$$

in some neighborhood of the feasible set is a strong local solution of the QP and vice versa, provided β is large enough. In minimizing Φ we can check the appropriate choice of β by checking the constraint violation of the approximating sequence $\{x^k\}$. That implies that for an unfeasible problem we will get $\beta \to \infty$, hence in that case finally a minimizer of the penalty term $||h(x)||_1 + ||(g(x))^-||_1$ subject to $x_{\mathcal{J}} \geq 0$ is found.

Remark: Since our method is purely primal we have no reliable estimates of the multipliers and hence will use a single penalty weight although individual weights for the constraints would be preferable. By a scaling of the constraints we try to overcome the disadvantage of doing so. □

Under the above assumption a second order sufficient point of the problem stays a strict local minimizer under perturbations of the problem and is Lipschitz continuous with respect to such perturbartions (see e.g. theorem 5.4 in Bonnans [2]).
For minimizing Φ directly specialized methods are known, e.g. the method of Conn and Sinclair [3]. We however intend to use standard methods of unconstrained resp. bound constrained minimization after smoothing abs(.) and min(.) appearing in the penalty term in order to be able to use the powerful methods for largescale bound constrained optimization.
Some short remarks about notation are in order: $||.||_1$ denotes the l1-norm whereas $||.||$ is the euclidean norm. Superscripts on vectors denote elements of sequences whereas subscripts denote components of a vector. We define

$$g_i^-(x) \;=\; \begin{cases} g_i(x) & \text{if } g_i(x) \le 0 \\ 0 \text{ otherwise} & \end{cases}$$

and

$$\mathcal{A} \;=\; \mathcal{A}(x) \;=\; \{i: \; g_i(x) = 0\} \; .$$

If A is some matrix and $\mathcal{B}$ an index set, then $A_{\mathcal{B}}$ denotes the submatrix of A made from the columns of A with numbers in $\mathcal{B}$

2 Smoothing abs(.) and min(.)

In order to replace the concave nonsmooth function

$$g_i^-(x) \;=\; \min\{0, g_i(x)\}$$

by a smooth one we use a function proposed by Lee and Mangasarian in [8], namely

$$\psi(y;\alpha) \;=\; y - \tfrac{1}{\alpha}\ln(1+\exp(\alpha y))$$

with

$$y \;=\; g_i(x) \;=\; (g^i)^T x + g_i^0 \; .$$

Here α is the smoothing parameter to be chosen. Lateron we will use an increasing sequence of values α_k. We have

$$\begin{aligned} \psi'(y;\alpha) &= \frac{1}{1+\exp(\alpha y)} \quad \in]0,1[\; , \\ \psi''(y;\alpha) &= -\frac{\alpha\exp(\alpha y)}{(1+\exp(\alpha y))^2} \quad \in]-\alpha/4, 0[\; . \end{aligned}$$

Hence

$$-\nabla_x \psi(g_i(x);\alpha) \;=\; -\frac{1}{1+\exp(\alpha g_i(x))} g^i$$

and

$$-\nabla_{xx}^2 \psi(g_i(x);\alpha) \;=\; \frac{\alpha\exp(\alpha g_i(x))}{(1+\exp(\alpha g_i(x)))^2} g^i (g^i)^T \; .$$

So we have a convex and very smooth approximation to the convex nonsmooth penalty term $-g_i^-(x)$. The error of this approximation is maximal at $y = g_i(x) = 0$ with a value of $\ln(2)/\alpha$. More generally we have

Theorem 1 *For all real y there holds*

$$|\min\{0,y\} - \psi(y;\alpha)| \;\leq\; \tfrac{4}{3}\tfrac{\exp(-\alpha|y|)}{\alpha}\;.$$

Proof

For $y < 0$ the expression on the left hand side evaluates to

$$|y - y + (1/\alpha)\ln(1+\exp(\alpha y))| \;=\; \ln(1+\exp(-\alpha|y|))/\alpha$$

whereas for $y > 0$ we use

$$(1/\alpha)\ln(1+\exp(\alpha y)) - y \;=\; \ln(1+\exp(-\alpha|y|))/\alpha\;.$$

Using the well known series expansion

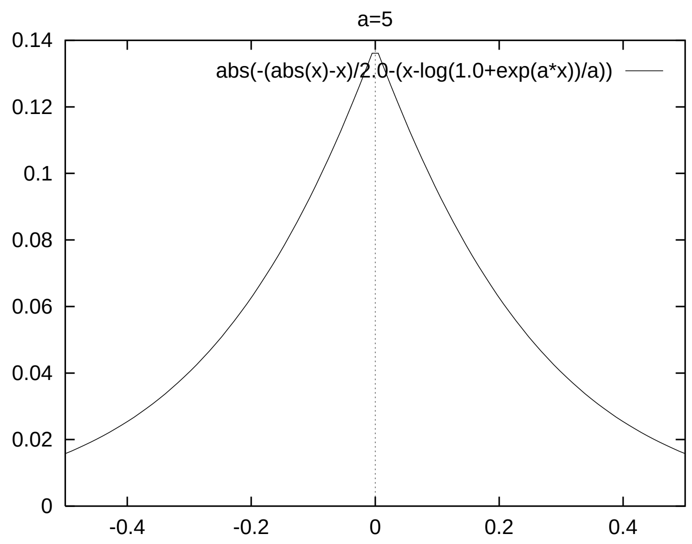
$$\ln(1+x) \;=\; 2\sum_{i=0}^{\infty}\tfrac{1}{2i+1}\left(\tfrac{z}{2+z}\right)^{2i+1}$$

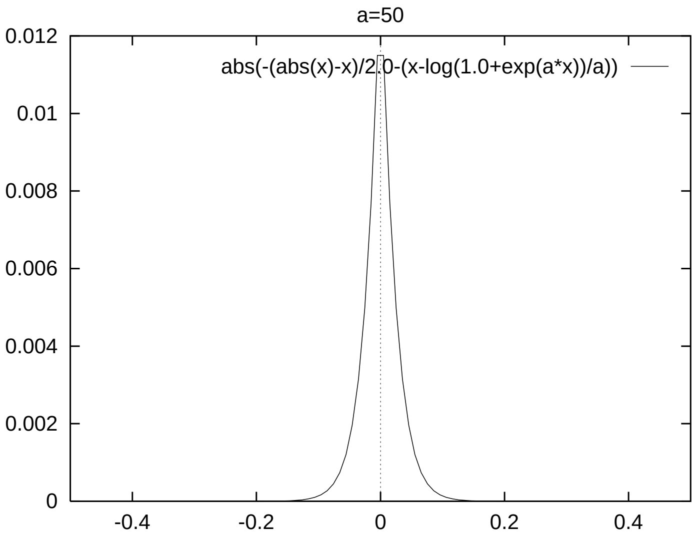
and $0 \leq \exp(-\alpha|y|) \leq 1$ we get

$$\frac{\ln(1+\exp(-\alpha|y|))}{\alpha} \;\leq\; \tfrac{4}{3}\tfrac{\exp(-\alpha|y|)}{\alpha}\;.$$

□

This result means that outside a very small neighborhood of 0 the approximation used is extraordinarily accurate. In the following diagrams we show the error for $a = \alpha = 5$ and $a = \alpha = 50$.





For $|.|$ we use the property

$$|y| \;=\; -(\min\{0,-y\}+\min\{0,y\})$$

obtaining

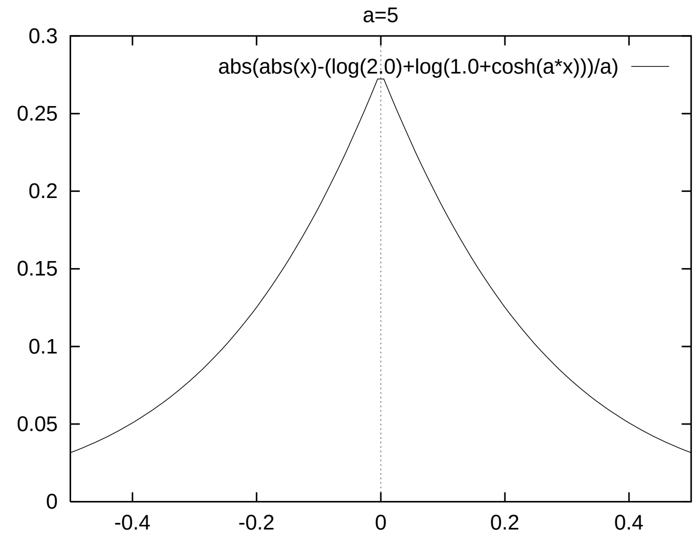
$$|y| \;\approx\; \phi(y;\alpha) \;=\; \tfrac{1}{\alpha}(\ln(2)+\ln(1+\cosh(\alpha y)))\;.$$

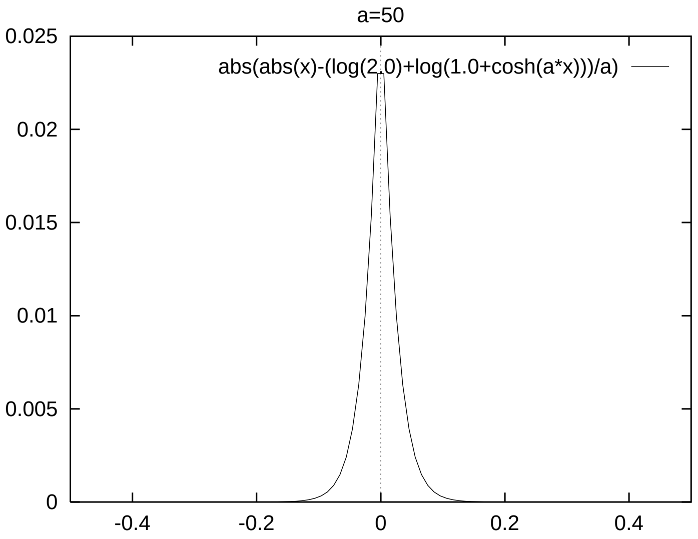
Also here the maximal error occurs at $y=0$ with a value of $2\ln(2)/\alpha$. Using the same techniques as in the foregoing theorem we get

Theorem 2 *For all real y we have*

$$||y|-\phi(y;\alpha)| \;\leq\; \tfrac{8}{3}\tfrac{\exp(-\alpha|y|)}{\alpha}\;.$$

The diagrams below show the error for $a=\alpha=5$ and $a=\alpha=50$





For the derivatives of ϕ we get

$$\phi'(y;\alpha) \;=\; \tfrac{\sinh(\alpha y)}{1+\cosh(\alpha y)} \quad \in\,]-1,1[$$

and

$$\phi''(y;\alpha) \;=\; \tfrac{\alpha}{1+\cosh(\alpha y)} \quad \in\,]0,\tfrac{\alpha}{2}]\ .$$

Hence

$$\nabla_x \phi(h_j(x);\alpha) \;=\; \tfrac{\sinh(\alpha h_j(x))}{1+\cosh(\alpha h_j(x))} h^j$$

and

$$\nabla^2_{xx}\phi(h_j(x);\alpha) \;=\; \tfrac{\alpha}{1+\cosh(\alpha h_j(x))} h^j(h^j)^T \;.$$

3 Minimization of the smoothed penalty function

Using the smoothing functions presented in the previous section we arrive at the unconstrained respectively bound constrained problem

Minimize

$$\begin{aligned}\Psi(x;\beta;\alpha) \;=\; & \tfrac{1}{2}x^TAx - b^Tx \\ & +\beta\Big(\sum_{j=1}^{p}\tfrac{1}{\alpha}\ln(1+\cosh(\alpha h_j(x))) - \sum_{i=1}^{m}(g_i(x) - \tfrac{1}{\alpha}\ln(1+\exp(\alpha g_i(x))))\Big)\end{aligned}$$

subject to $\quad x_{\mathcal{J}} \;\geq\; 0$.

Here β is in principle fixed and will be increased only if we detect an infeasible minimizer of Φ. α however has to be chosen large in order to obtain a good overall approximation of the solution. This might result in poor performance, since for very large α the smoothed function will exhibit sharp curvature along the hyperplanes $h_j(x) = 0$ resp. $g_i(x) = 0$. But there will be no illconditioning of the Hessian like the one occuring with differentiable penalty functions, since β will be kept bounded. Therefore we propose to use an increasing sequence $\alpha_0 < \alpha_1 < \ldots$ with sequential minimization of Ψ, taking the minimizer $x(\alpha_i)$ for $\alpha = \alpha_i$ as initial guess for $x(\alpha_{i+1})$. Since we use a rather powerful Newton like minimizer in our practical tests we had good success with $\alpha \in \{10, 10^2, 10^3, 10^4, 10^5\}$, but one may also think about varying α slowly. Since we aim in solving large scale cases with A possibly indefinite we decided to use as minimizer the Lanczos based code `PL2` of our PhD student Felkel [4], [5]. This combines gradient projection steps with a Lanczos based minimization on boundary manifolds. For a <u>fixed</u> active set $\{i : x_i \;=\; 0\;,\; i \;\in \mathcal{J}\}$ a number $\nu \;\leq\; \nu_{\max} \;\leq\; n$ of Lanczos steps is performed on the projected Hessian H_k of Ψ at x^k. In order to simplify the notation we omit the index k denoting the dependency on the iteration point in the following. We set

$$H \;=\; I_{\mathcal{B}}^T\nabla^2\Phi(x;\beta;\alpha)I_{\mathcal{B}}$$

with $\mathcal{B} = \{1,\ldots,n\} \setminus \{i : x_i \;=\; 0\;,\; i \;\in \mathcal{J}\}$ In the Lanczos step ν we have

$$HQ_\nu - Q_\nu T_\nu = \gamma_{\nu+1}q_{\nu+1}e_\nu^T$$

with

$$Q_\nu^TQ_\nu \;=\; I \;\text{ and } T_\nu \text{ tridiagonal}\;.$$

Using the spectral decomposition of T_ν up to three directions for a possible move are defined. If

$$T_\nu \;=\; V_\nu\Lambda_\nu V_\nu^T$$

with $\Lambda_\nu \;=\; \mathrm{diag}(\lambda_1,\ldots,\lambda_\nu)$ where $\lambda_1 \;\leq\; \ldots \;\leq\; \lambda_\nu$ are the eigenvalues of T_ν which in turn are approximations to some eigenvalues of H , define the index sets

$$\mathcal{N}_1 \;=\; \{i \;:\; \lambda_i \;\geq\; 0\;\}\;,$$

$$
\begin{aligned}
\mathcal{N}_2 &= \{ i \, : \, \lambda_i \, < \, 0 \, \} \, , \\
\mathcal{N}_3 &= \mathcal{N}_2 \setminus \{1\} \, ,
\end{aligned}
$$

and let

$$S_\nu \; = \; Q_\nu V_\nu \; .$$

Then

$$
\begin{aligned}
d &= \begin{cases} (S_\nu)_{\mathcal{N}_1} (\tilde{\Lambda}_\nu)^{-1} ((S_\nu)_{\mathcal{N}_1})^T \nabla \Phi(x; .; .) & \text{if } \mathcal{N}_1 \neq \emptyset \\ 0 & \text{otherwise} \end{cases} \\
\tilde{\lambda}_i &= \max\{\varrho, \lambda_i\} \text{ with some } \varrho > 0 \\
r &= \begin{cases} (S_\nu)_{\mathcal{N}_3} ((S_\nu)_{\mathcal{N}_3})^T \nabla \Phi(x; .; .) & \text{if } \mathcal{N}_3 \neq \emptyset \\ 0 & \text{otherwise} \end{cases} \\
z &= \begin{cases} (S_\nu)_{\{1\}} & \text{if } \mathcal{N}_2 \neq \emptyset \\ 0 & \text{otherwise} \end{cases} \; .
\end{aligned}
$$

Normalize d, r and z such that the first directional derivative of Ψ becomes nonpositive in these directions. Then make three moves along d, r, z in succession using an Armijo type step size rule (backtracking) if the second directional derivative of Ψ in that direction is positive and a specialized modified backtracking if it is negative. This gives the next point in the form

$$x^{k+1} \; = \; x^k + \sigma_{k,d} d^k + \sigma_{k,r} r^k + \sigma_{k,z} z^k$$

with <u>independent</u> stepsizes $\sigma_{k,d}$, $\sigma_{k,r}$ and $\sigma_{k,z}$. One could also think about a box constrained minimization of Ψ in the up to three dimensional subspace spanned by these directions but for reasons of simplicity this has not been done in the present implementation. If $\nu = n$ and full reorthogonalization would be used this technique would be a full Newton scheme with the additional use of directions of negative curvature in the nonconvex case. The details of the stepsize technique can be found in [4], [7]. If the active bound constraints change then gradient projection steps are used like in [10].
For this process the following can be shown

Theorem 3 *Assume that the sequence generated by the algorithm stays bounded and that sufficient accuracy is obtained in the Lanczos process in the sense that*

$$(S_{k,\nu})_{\{1\}}^T H_k (S_{k,\nu})_{\{1\}} \; \leq \; \gamma \lambda_{\min}(H_k) \quad \textit{if } \lambda_{\min}(H_k) < 0$$

for some γ with $0 < \gamma < 1$. Assume also that there are only finitely many second order necessary points of $\Psi(.;.;.)$ (β and α fixed). Then the sequence $\{x^k\}$ converges to such a second order necessary point.

For a proof see [4]. This algorithm is an adaptation of Heinrichs "3-directions algorithm" from [7] to the large scale case.

4 Approximation properties of the overall process

In this section we aim in showing that the method approximates a strict second order sufficient point of the original problem with an error of $\mathcal{O}(1/\alpha)$. To this end we assume that the method identifies a strict second order sufficient point $\hat{x}$ of the problem

$$\text{Minimize } \Psi(x;\beta,\alpha) \quad \text{subject to} \quad x_{\mathcal{J}} \ \geq \ 0 \ .$$

Because at best we can show that a second order necessary point will be identified this assumption cannot be avoided. We even could not guarantee that the method will generate a convergent sequence since we did not assume positive semidefiniteness for A. Hence outside the feasible domain the penalty function and its smoothing may not even be bounded from below. If we would assume compactness of the feasible set (or enforce it by addition of box constraints) and modify the penalty function and its smoothing by addition of a quadratic penalty term, say

$$||A||(||h(x)||_2^2 + ||g(x)^-||_2^2)$$

then compactness of $\{x^k\}$ and hence convergence of suitable subsequences would follow, but we leave that aside for simplicity of the presentation.
We first show that

$$\varphi(\hat{x}) \ \stackrel{def}{=} \ ||h(\hat{x})|||_1 + ||(g(\hat{x}))^-||_1 \ \leq \ \mathcal{O}(1/\alpha) \ .$$

From our assumptions we know that there exists some Slater point of the original problem x^0 satisfying

$$h(x^0) \ = \ 0 \ , \quad g_{\mathcal{A}\cup\mathcal{V}}(x^0) \ > \ 0 \ , \ x^0 \ > \ 0 \ ,$$

where

$$\mathcal{A}\cup\mathcal{V} \ = \ \{i : \ g_i(\hat{x}) \ \leq \ 0\} \ .$$

From convexity it follows that all inequality constraints satisfied in $\hat{x}$ are satisfied along the ray

$$\hat{x} + \tau(x^0 - \hat{x}) \ , \quad 0 \ \leq \ \tau \ \leq 1 \ .$$

For some suitable $\tau_0 \ \in \ ]0,1[$ there holds

$$0 \ \leq \ g_{\mathcal{A}\cup\mathcal{V}}(\hat{x} + \tau_0(x^0 - \hat{x})) \ \leq \ \mathcal{O}(\varphi(\hat{x})) \ .$$

From the linearity of the constraints it follows then that

$$||\tau_0(x^0 - \hat{x}))|| \ = \ \mathcal{O}(\varphi(\hat{x})) \ .$$

We consider now Ψ along this ray and compare it with the exact penalty function Φ, using the error estimates developed above. With

$$d \ = \ x^0 - \hat{x}$$

we have for some τ_1

$$\varphi(\hat{x} + \tau d) \ = \ 0 \quad \text{for } \tau_1 \ \leq \ \tau \ \leq \ \tau_0$$

and hence

$$\Phi(\hat{x}+\tau_1 d;\beta) \;\leq\; \Phi(\hat{x};\beta)+\frac{\tau_1^2}{2}||d||^2||A||+\tau_1||d||||A\hat{x}-b||-\beta\varphi(\hat{x}) \;,$$

whereas

$$\Phi(\hat{x};\beta) \;\leq\; \Psi(\hat{x};\beta,\alpha)+\tfrac{8}{3}(m+p)\frac{\beta}{\alpha}$$

and

$$\Psi(\hat{x}+\tau_1 d;\beta,\alpha) \;\leq\; \Phi(\hat{x}+\tau_1 d;\beta)+\tfrac{8}{3}(m+p)\frac{\beta}{\alpha}\;.$$

Combining these inequalities we get

$$\Psi(\hat{x}+\tau_1 d;\beta,\alpha) \;\leq\; \Psi(\hat{x};\beta,\alpha)+\tfrac{16}{3}(m+p)\frac{\beta}{\alpha}+\frac{\tau_1^2|}{2}||d||^2||A||+\tau_1||d||||A\hat{x}-b||-\beta\varphi(\hat{x})$$

and

$$||\tau_1 d|| \;=\; \mathcal{O}(\varphi(\hat{x})) \text{ with the constant independent of } \alpha \text{ and } \beta\;.$$

Therefore, if β is large enough and $\varphi(\hat{x}) \;=\; \frac{C}{\alpha}$ for a suitable constant C, then we get

$$\Psi(\hat{x}+\tau_1 d;\beta;\alpha,\beta) \;<\; \Psi(\hat{x};\alpha,\beta) \quad \text{and} \quad ||\tau_1 d|| \;=\; \mathcal{O}(\varphi(\hat{x})) \;=\; \mathcal{O}(1/\alpha)$$

which gives a contradiction to the assumption that $\hat{x}$ is a strict local minimizer of Ψ for large enough α. The constants in this analysis are unknown in practice. Hence in our practical algorithm we check the appropriateness of the choice of β by checking

$$\varphi(\hat{x}) \;\geq\; \frac{1}{\alpha^\eta}\;, \quad 0 \;<\; \eta \;<\; 1 \text{ fixed}$$

and continue the computation with β increased if this turns out to be true. Now, at a minimzer of Ψ we have

$$A\hat{x}-b+\beta\sum_{i=1}^{p}\frac{\sinh(\alpha h_j(\hat{x}))}{1+\cosh(\alpha h_j(\hat{x}))}h^i-\beta\sum_{i=1}^{m}\frac{1}{1+\exp(\alpha g_i(\hat{x}))}g^i \;=\; I_{\mathcal{J}}\nu_{\mathcal{J}}$$

with $\nu_{\mathcal{J}} \;\geq\; 0$ and $\nu_i x_i \;=\; 0$ for $i \;\in\; \mathcal{J}$. If we define

$$\hat{\mu}_j \;=\; \beta\frac{\sinh(\alpha h_j(\hat{x}))}{1+\cosh(\alpha h_j(\hat{x}))}$$

and

$$\hat{\lambda}_i \;=\; \beta\frac{1}{1+\exp(\alpha g_i(\hat{x}))}$$

then the Lagrangian condition and the dual feasibility condition for the original problem are automatically satisfied. Next we show that also the complementarity condition is satisfied up to an error of $\mathcal{O}(1/\alpha)$. Since by definition

$$g_i(\hat{x})\hat{\lambda}_i \;=\; \beta\frac{g_i(\hat{x})}{1+\exp(\alpha g_i(\hat{x}))}$$

and

$$\beta\frac{y}{1+\exp(\alpha y)} \;\leq\; \beta\frac{1.2784}{\alpha(1+\exp(1.2784))} \quad \forall\; y \;\in \mathbb{R}$$

and

$$g_i(\hat{x}) \;\geq\; -\frac{C}{\alpha}$$

for some suitable C as already shown this follows immediately. Finally, the Hessian of Ψ is

$$A + \beta\alpha(HD_1H^T + GD_2G^T)$$

with

$$\begin{aligned} D_1 &= \operatorname{diag}(\frac{1}{1+\cosh(\alpha h_i(\hat{x}))}) \;, \\ D_2 &= \operatorname{diag}(\frac{\exp(\alpha g_i(\hat{x}))}{(1+\exp(\alpha g_i(\hat{x})))^2}) \;. \end{aligned}$$

From this it is clear that inequality constraints with are strictly satisfied play no role here for large enough α. Hence, from the assumed positive definiteness of this matrix on the null space of the gradients of the active bound constraints it follows that A must be positive definite on the intersection of this space with the null space of the matrix

$$\begin{pmatrix} H^T \\ G^T_{\mathcal{A}\cup\mathcal{V}} \end{pmatrix}$$

That means that we have identified a strict second order sufficient point of the original QP-problem.

5 Perturbation analysis of the problem

Here we deal with the question how accurate the computed solution $\hat{x}$, $\hat{\mu}$, $\hat{\lambda}$ might be with respect to the original problem. Consider the KUHN-TUCKER system of the original problem. Let $\hat{x}$ be some $x(\alpha)$ and x^* a point satisfying constraint regularity , strict second order sufficiency and strict complementarity of the original problem. (strict complementarity is needed here only for characterizing second order sufficiency by positive definiteness of the projected Hessian). As shown in the previous section can assume that the Kuhn-Tucker conditions of the QP are satisfied up to an error of $\mathcal{O}(1/\alpha)$ and we are interested in the precision obtainable for the primal and the dual variables of the original problem. Linearization of the Kuhn-Tucker system gives

$$\begin{pmatrix} A & -H & -G_{\mathcal{A}} \\ H^T & O & O \\ G^T_{\mathcal{A}} & O & O \end{pmatrix} \begin{pmatrix} \hat{x} - x^* \\ \hat{\mu} - \mu^* \\ \hat{\lambda}_{\mathcal{A}} - \lambda^*_{\mathcal{A}} \end{pmatrix} = \begin{pmatrix} \mathcal{O}(1/\alpha) \\ \mathcal{O}(1/\alpha) \\ \mathcal{O}(1/\alpha) \end{pmatrix}$$

Here $\mathcal{A} = \mathcal{A}(x^*) = \mathcal{A}\cup\mathcal{V}(\hat{x})$ for α sufficiently large. Let be Q and V unitary giving the singular values decomposition

$$Q(H, G_{\mathcal{A}})V^T \;=\; \begin{pmatrix} \Sigma \\ O \end{pmatrix}$$

and with a corresponding partitioning

$$QAQ^T \;=\; \begin{pmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \end{pmatrix} \;,$$

and $\Delta x^I, \Delta x^{II}$ the vertical and horizontal correction

$$Q(\hat{x} - x^*) \; =: \; \begin{pmatrix} \Delta x^I \\ \Delta x^{II} \end{pmatrix} \text{ and } V \begin{pmatrix} \hat{\mu} - \mu^* \\ \hat{\lambda} - \lambda^* \end{pmatrix} \; =: \; \Delta(\mu, \lambda) \; .$$

Then

$$\begin{pmatrix} C_{11} & C_{12} & \Sigma \\ C_{21} & C_{22} & O \\ \Sigma & O & O \end{pmatrix} \begin{pmatrix} \Delta x^I \\ \Delta x^{II} \\ \Delta(\mu, \lambda) \end{pmatrix} = \begin{pmatrix} \mathcal{O}(1/\alpha) \\ \mathcal{O}(1/\alpha) \\ \mathcal{O}(1/\alpha) \end{pmatrix}$$

This means

$$\begin{aligned} \Delta x^I &= \mathcal{O}(||\Sigma^{-1}||/\alpha) \; , \\ \Delta x^{II} &= \mathcal{O}(||C_{22}^{-1}||/\alpha) + \mathcal{O}(||C_{21}||||C_{22}^{-1}||||\Sigma^{-1}||/\alpha) \; , \\ \Delta(\mu, \lambda) &= \mathcal{O}(||\Sigma^{-1}||/\alpha) + \mathcal{O}(||C_{11}||||\Sigma^{-1}||^2/\alpha) \\ &\quad + \mathcal{O}(||C_{21}||||C_{22}^{-1}||||\Sigma^{-1}||/\alpha) \\ &\quad + \mathcal{O}(||C_{12}||||C_{21}||||C_{22}^{-1}||||\Sigma^{-1}||^2/\alpha) \; . \end{aligned}$$

From this the see that the multipliers are much more sensitive against illconditioning in the problem as the primal variable, especially if the coupling term C_{21} does not vanish. This is in complete accordance with the observations made during the numerical testing of the method.

6 Numerical tests

As a preliminary test for the viability of the method we wrote a wrapper for R. Felkels Lanczos based code `PL2` [6]. A simplified version of the problem was considered, namely

$$\tfrac{1}{2} x^T A x - b^T x \stackrel{!}{=} \min_x \qquad \text{subject to } H^T x + h^0 \; = \; 0 \; , \; x \; \geq \; 0 \; .$$

From a randomly chosen $n \times p$ matrix we computed the singular values decomposition in order to obtain random unitary matrices U and V^T of dimension $n \times n$ and $p \times p$. In order to test the possibility of the method to deal also successfully with degenerate problems we allowed H to be rank deficient. H was chosen as

$$H \; = \; U \begin{pmatrix} \Sigma \\ O \end{pmatrix} V^T$$

with $\Sigma \; = \; \mathrm{diag}(\sigma_i)$ and σ_i chosen randomly in an interval $[\sigma_{\min}, 1]$, $\sigma_{\min}$ a chosen parameter, and then a fixed percentage c set to zero. μ_j^* and λ_i^* were chosen in $[-\gamma, \gamma]$ respectively $[\gamma\lambda_{low}, \gamma]$. x^* was generated randomly in $[x_{low}, 1]$ and then j_0 components set to zero with the complementary $n - j_0$ components of λ^* set to zero such that the strict complementarity condition was satisfied. Then we computed h^0 from

$$h^0 \; = \; -H^T x^*$$

and b from

$$b \; = \; Ax^* - H\mu^* - \lambda^* \; .$$

Here the Hessian A was constructed using

$$A = UDU^T$$

with $D = \operatorname{diag}(\delta_i)$ where

$$\delta_i = \begin{cases} \in [-1,1] resp. \in [0,1] \text{ for } i = 1,\dots,p \\ \in [\delta_{\min}, 1] \text{ for } i = p+1,\dots,n \end{cases}$$

with $\delta_{\min} > 0$ another chosen parameter. The problem will be convex or nonvex depending on whether we allow negative δ_i or not. The construction has the advantage that we know that x^* is a strict second order sufficient point of the QP. A disadvantage is that the coupling term C_{21} discussed in the previous section is not present here. Each problem is now characterized by the following set of parameters:

$$\begin{aligned}
n &= \text{primal dimension} \\
p &= \text{number of equality constraints} \\
j_0 &= \text{number of acitve bounds} \\
c &= \text{degree of degeneracy of } H \\
\sigma_{\min} &= \text{reciprocal of condition number of the regular part of } H \\
\delta_{\min} &= \text{reciprocal of condition number of projected Hessian} \\
\gamma &= \text{upper bound for the multipliers, hence lower bound for } \beta \\
\lambda_{low} &= \text{lower bound for the nonzero inequality multipliers} \\
x_{low} &= \text{lower bound for the nonegative primal variables}
\end{aligned}$$

The reader should obeserve that for our construction A and H are dense matrices, hence the computational effort for the Lanczos steps is considerable. E.g. for $n = 1000$, $p = 7n/10$ one matrix-vector multiply with the Hessian of Ψ requires about 2.4 million multiplications and additions. The following parameter choices were made

$$\begin{aligned}
n &\in \ 100, 200, \dots, 1000 \\
p &\in n/10,\ n/2\ ,\ 7n/10 \\
j_0 &\in (n-p)/4\ ,\ (n-p)/2\ ,\ n-p \\
\sigma_{\min} &\in \{0.1, 0.01, 0.001, 0.0001\} \\
\lambda_{low} &= \sigma_{\min} \\
\delta_{\min} &= \ \sigma_{\min} \\
x_{low} &= \ \sigma_{\min} \\
\gamma &= \ 1\ .
\end{aligned}$$

In the algorithm, β was initialized with $\beta = 10$, hence no necessity for increasing the weight occured.
We took

$$\alpha \in \{10, 100, 1000, 10000, 100000\}\ .$$

In a second test a percentage of the singular values of H were set to zero with no loss in performance, but of course the used multipliers could not be reconstructed since they build now a linear manifold.
Remark: also some true nonconvex QP's were solved successfully, but since one needs to know the optimal second order Kuhn Tucker points this was restricted to some very small examples. The (very good) results obtained then are not representative for the power of the method since this works of course like a true Newton descent method if the maximum number of allowed Lanczos steps is larger than the dimension n. The maximum number of Lanczos steps was set to 100 in all our tests. □

In the following we give some representative results only, the complete tables of results can be found in the appendix. The computer used was an

AMD Athlon K6 with 1GHz frequency, 1GB main memory, 512K level 1-cache

under LINUX. The compiler command

g77 -O3 -fexpensive-optimizations -funroll-loops

The initial point was chosen to be $x^0 = (1, \ldots, 1)^{\cdot}$ In the following table four consecutive rows correspond to the consecutive settings

$$\delta_{\min} = \sigma_{\min} = \lambda_{low} = x_{low} = 0.1, 0.01, 0.001, 0.0001 \ .$$

`x_err`, `mu_err` and `l_err` are the normrelative errors in $\hat{x}$, $\hat{\mu}$ and $\hat{\lambda}$ repectively. Infeasibility is $\varphi(\hat{x})$. The time used is in seconds.

```
# case 1:
# full rank H
#  p=n/10  j0=(n-p)/4
# n=       x_err          mu_err          l_err   infeasibility time used
 1000 0.9861361E-05 0.6381079E-03 0.5826738E-04 0.1073825E-03 0.3802E+02
 1000 0.1914990E-03 0.3397416E-02 0.2263751E-03 0.1045934E-03 0.6740E+02
 1000 0.2093874E-03 0.7542928E-01 0.6866571E-03 0.1084784E-03 0.4533E+02
 1000 0.1606602E-03 0.6945291E-01 0.1021613E-03 0.1012609E-03 0.5363E+02
#  p=n/10  j0=(n-p)/2
 1000 0.7868683E-05 0.1011392E-02 0.1198903E-03 0.9418754E-04 0.3729E+02
 1000 0.4414621E-04 0.2990771E+00 0.8941027E-02 0.1149296E-03 0.4405E+02
 1000 0.1162170E-03 0.1411274E-01 0.3783200E-03 0.1041085E-03 0.8468E+02
 1000 0.5577592E-04 0.4117414E-01 0.2057803E-03 0.9896492E-04 0.5156E+02
#  p=n/10  j0=n-p
 1000 0.1721513E-04 0.2686093E-01 0.3660428E-02 0.9721432E-04 0.7153E+02
 1000 0.4440768E-04 0.5509494E-01 0.1329308E-02 0.9450339E-04 0.1149E+03
 1000 0.2964044E-04 0.1080884E+00 0.1148603E-02 0.9697426E-04 0.1099E+03
 1000 0.3767001E-04 0.1041676E+00 0.1543153E-02 0.1008451E-03 0.1011E+03
#  p=7n/10 j0=(n-p)/4
 1000 0.5921736E-04 0.9840429E-03 0.2868041E-03 0.7018807E-03 0.7007E+02
```

```
 1000 0.5204020E-03 0.5412210E-02 0.7481088E-03 0.7107304E-03 0.1124E+03
 1000 0.3581690E-03 0.2190195E-01 0.7388608E-03 0.6895207E-03 0.1240E+03
 1000 0.3909086E-03 0.3058185E-01 0.6151118E-03 0.6987279E-03 0.1022E+03
#  p=7n/10 j0=n-p
 1000 0.8428248E-04 0.6350421E-01 0.1725088E-01 0.7043341E-03 0.1537E+03
 1000 0.7755651E-04 0.5580629E-01 0.5944753E-02 0.6708944E-03 0.1719E+03
 1000 0.1143870E-03 0.6945690E-01 0.4575259E-02 0.7445465E-03 0.2006E+03
 1000 0.1343231E-03 0.6596913E-01 0.2418520E-02 0.7263210E-03 0.1831E+03

==============================================================================
# case 2:
#rank of equation has defect p* 0.100
#  p=7n/10 j0=n-p
# n=       x_err          mu_err       l_err       infeasibility  time used
 1000 0.6183842E-04 0.2112457E+00 0.5098011E-03 0.6662885E-03 0.1440E+03
 1000 0.1233072E-03 0.1801404E+00 0.1176253E-02 0.6454064E-03 0.2155E+03
 1000 0.1265696E-03 0.2022096E+00 0.1008539E-02 0.6467454E-03 0.2361E+03
 1000 0.1971318E-03 0.1893462E+00 0.1551604E-02 0.6674516E-03 0.1707E+03
```

7 Conclusion and open questions

The results obtained so far are in full accordance with the theory. Exact penalization with smoothing seems to work well and at least the final precision of the primal variable is quite good. But a lot of open questions remain. Firstly, it is unclear how to compute the penalty weight β adaptively other than by checking the final $\varphi(\hat{x})$, that is after completion of the minimization for α fixed. This test however, based on the asymptotic properties of the method, is somewhat crude. Moreover, it may be much more efficient to adapt β during the run with α fixed. But presently no reliable method for doing so has been found. Here we have a trouble similar to the one one has in chosing the penalty parameter for augmented Lagrangians. It is also unclear whether it might be better to change the smoothing parameter α fast or slowly, or even between several Lanczos steps. In the present tests `PL2` was treated as a "black box". It might be better to tune the code for this application and especially the type of reorthogonalization and the most useful bound for the number of Lanczos steps needs investigation. (Presently partial reorthogonalization as proposed by Parlett [13] is in use).

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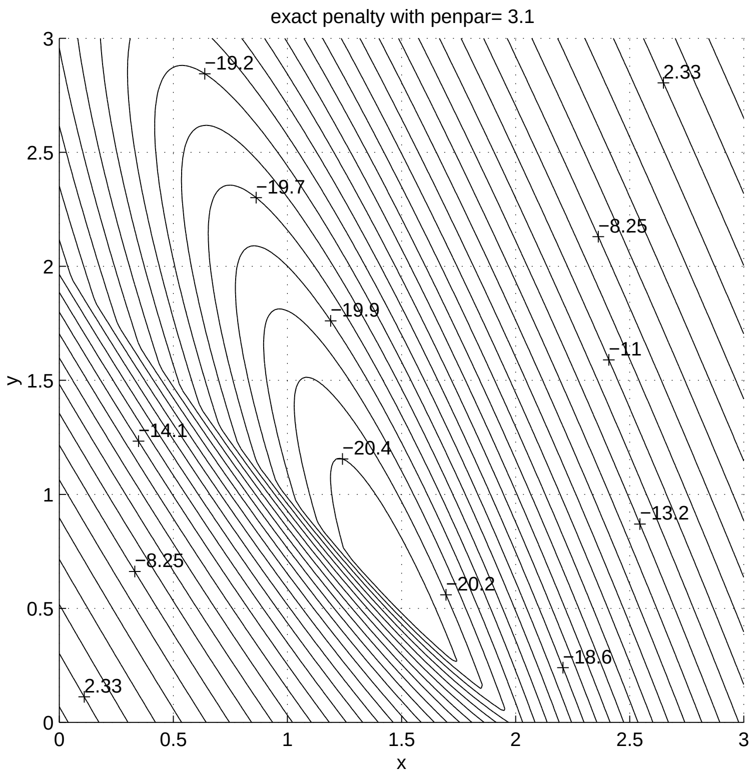
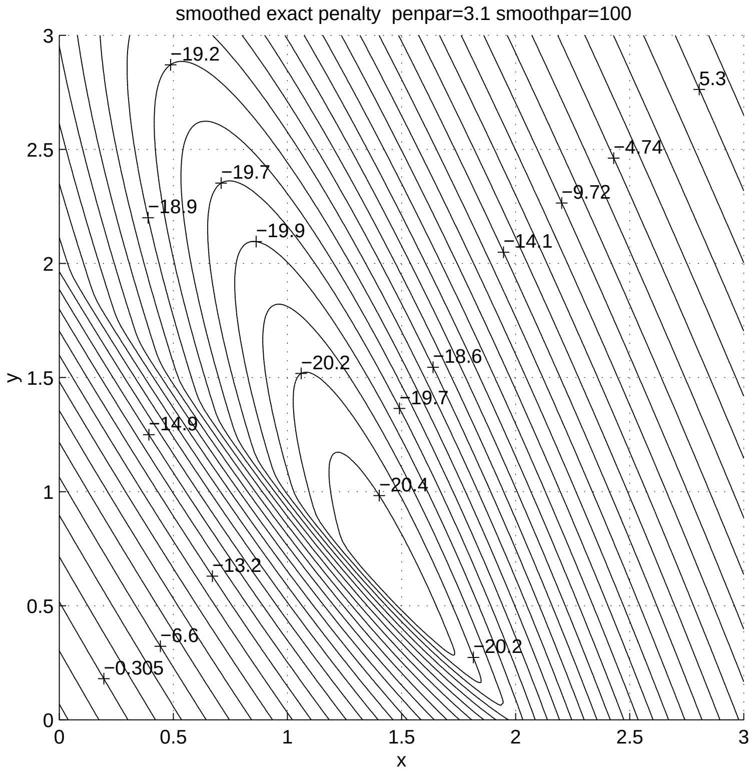
8 Some graphics

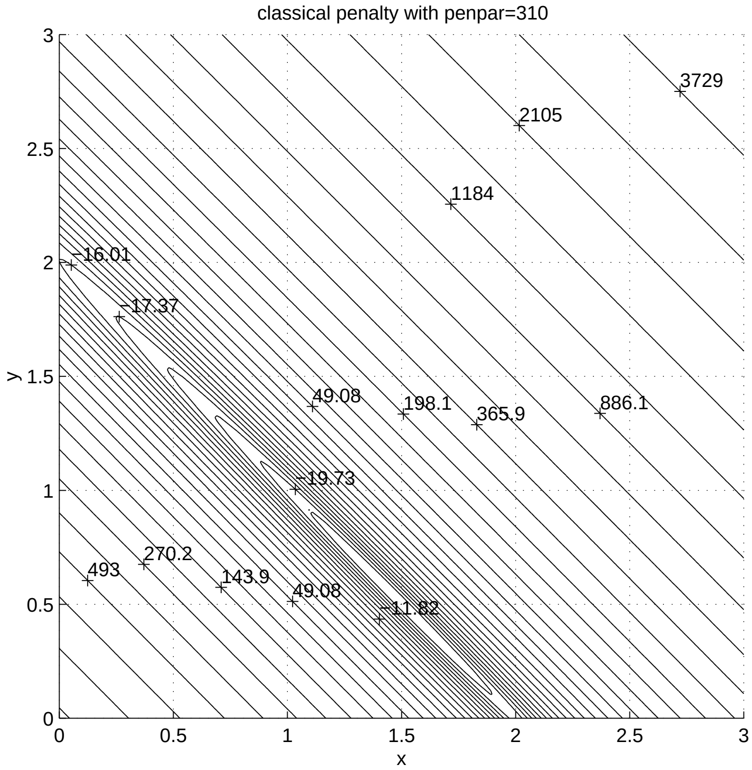
In order to give the reader an impression how Φ, the smoothing Ψ and the classical smooth penalty function look like for comparable penalty parameters we include here the graphics for the very simple twodimensional problem

$$\text{Minimize } x_1^2 + 4x_1x_2 + 5x_2^2 - 10x_1 - 20x_2 \quad \text{subject to } x_1 + x_2 - 2 \ = \ 0 \ .$$

The problem has the solution $x_1 \ = \ 1.5$, $x_2 \ = \ 0.5$, $\mu_1 \ = \ 3$ and the condition number of the Hessian of the Lagrangian is 33.98. The classical quadratic loss function approximates the solution with an error of about $3/\varrho$ with the penalty term $\varrho(h_1(x))^2$. The l1 penalty function is exact with $\beta > 3$. We choose $\beta = 3.1$ here. The smoothing parameter is $\alpha = 100$ such that the precision should be comparable to that of the classical penalty approach. The pictures show the exact nondifferentiable function with penaltyparameter $\beta = 3.1$, the classical differentiable quadratic loss function with penaltyparameter 310 (which will give theoretically the same accuracy as the smoothed version of the exact one) and the smoothed function with $\beta = 3.1$ and $\alpha = 100$. Even with this rather crude smoothing almost no difference between the nondifferentiable function and its smoothing is to be seen and no illconditioning is shown by the level sets of the smoothing function whereas already here the illconditioning of the quadratic loss function is obvious.




smoothed exact penalty penpar=3.1 smoothpar=100
−19.2
5.3
−4.74
−19.7
−9.72
−18.9
−19.9
−14.1
−20.2
−18.6
−19.7
−14.9
−20.4
−13.2
−6.6
−20.2
−0.305
x
y
0
0.5
1
1.5
2
2.5
3


classical penalty with penpar=310
3729
2105
1184
−16.01
−17.37
49.08
198.1
365.9
886.1
−19.73
270.2
493
143.9
49.08
−11.82
x
y
0
0.5
1
1.5
2
2.5
3

9 Appendix

Here follow the complete lists of results for the tests described above. The first table concerns the convex case with H of full rank.

```
gerechnet auf fb04373 mit -O3 -fexpensive-optimizations -funroll-loops

#  p=n/10  j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.2389098E-05   0.6112512E-04   0.5180688E-06   0.9944196E-05   0.3000000E-01   0.1000000E+02   0.1000000E+06
  200 0.1307463E-05   0.1685494E-04   0.4024781E-06   0.1998671E-04   0.1499999E+00   0.1000000E+02   0.1000000E+06
  300 0.1408667E-05   0.2000689E-04   0.3143748E-06   0.3014988E-04   0.1150000E+01   0.1000000E+02   0.1000000E+06
  400 0.2463515E-05   0.3830585E-03   0.3525477E-04   0.4175788E-04   0.4640003E+01   0.1000000E+02   0.1000000E+06
  500 0.4898155E-05   0.1616729E-03   0.1227589E-04   0.4772606E-04   0.7699997E+01   0.1000000E+02   0.1000000E+06
  600 0.3998949E-05   0.4255257E-03   0.4973113E-04   0.5767256E-04   0.1125000E+02   0.1000000E+02   0.1000000E+06
  700 0.8007825E-05   0.6899919E-03   0.8297298E-04   0.6550595E-04   0.1481000E+02   0.1000000E+02   0.1000000E+06
  800 0.1344296E-05   0.1493781E-03   0.1293745E-04   0.7781562E-04   0.2648001E+02   0.1000000E+02   0.1000000E+06
  900 0.1767973E-05   0.1355942E-03   0.1385471E-04   0.8311104E-04   0.2894995E+02   0.1000000E+02   0.1000000E+06
 1000 0.9861361E-05   0.6381079E-03   0.5826738E-04   0.1073825E-03   0.3802997E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.2075643E-04   0.5635689E-02   0.5840951E-05   0.1082251E-04   0.7000732E-01   0.1000000E+02   0.1000000E+06
  200 0.2409778E-05   0.1265828E-03   0.5646607E-06   0.2079566E-04   0.2299805E+00   0.1000000E+02   0.1000000E+06
  300 0.9880585E-05   0.1156936E-03   0.5976426E-05   0.3010401E-04   0.4640015E+01   0.1000000E+02   0.1000000E+06
  400 0.1005145E-03   0.2120640E-02   0.1541112E-03   0.4453428E-04   0.7409912E+01   0.1000000E+02   0.1000000E+06
  500 0.1189044E-03   0.3583996E-02   0.1509007E-03   0.5613223E-04   0.1017004E+02   0.1000000E+02   0.1000000E+06
  600 0.1252123E-03   0.5676322E-02   0.2796977E-03   0.6084804E-04   0.1564001E+02   0.1000000E+02   0.1000000E+06
  700 0.1218014E-03   0.2333142E-02   0.1465209E-03   0.8027617E-04   0.2150000E+02   0.1000000E+02   0.1000000E+06
  800 0.1780009E-03   0.2089611E-02   0.1294675E-03   0.8381249E-04   0.3280994E+02   0.1000000E+02   0.1000000E+06
  900 0.8950177E-04   0.3243206E-02   0.2100067E-03   0.9198816E-04   0.3868005E+02   0.1000000E+02   0.1000000E+06
 1000 0.1914990E-03   0.3397416E-02   0.2263751E-03   0.1045934E-03   0.6740015E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.9737604E-04   0.3180433E-01   0.1794987E-04   0.9099455E-05   0.3002930E-01   0.1000000E+02   0.1000000E+06
  200 0.1460234E-03   0.7148243E-01   0.3261392E-04   0.2161398E-04   0.2600098E+00   0.1000000E+02   0.1000000E+06
  300 0.5473498E-04   0.1834833E-01   0.1036575E-04   0.2773441E-04   0.2860107E+01   0.1000000E+02   0.1000000E+06
  400 0.9514218E-04   0.5111976E-02   0.8312560E-04   0.4298237E-04   0.5950195E+01   0.1000000E+02   0.1000000E+06
  500 0.1308858E-03   0.9861553E-01   0.3367409E-03   0.4770702E-04   0.1048999E+02   0.1000000E+02   0.1000000E+06
  600 0.2087366E-04   0.2878700E-01   0.9339180E-04   0.5825468E-04   0.1818018E+02   0.1000000E+02   0.1000000E+06
  700 0.1566901E-03   0.2400802E-02   0.2559963E-03   0.6877271E-04   0.1757007E+02   0.1000000E+02   0.1000000E+06
  800 0.6538945E-04   0.3361627E-01   0.4982057E-04   0.8149415E-04   0.2577002E+02   0.1000000E+02   0.1000000E+06
  900 0.2143613E-03   0.4073652E-01   0.1795372E-03   0.1039823E-03   0.4304004E+02   0.1000000E+02   0.1000000E+06
 1000 0.2093874E-03   0.7542928E-01   0.6866571E-03   0.1084784E-03   0.4533984E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.6685626E-05   0.1475700E+00   0.1336968E-05   0.1002187E-04   0.6005859E-01   0.1000000E+02   0.1000000E+06
  200 0.1661543E-04   0.8853878E-01   0.2620019E-05   0.2241278E-04   0.2797852E+00   0.1000000E+02   0.1000000E+06
  300 0.3177883E-05   0.7228544E-01   0.5981640E-06   0.2713095E-04   0.2129883E+01   0.1000000E+02   0.1000000E+06
  400 0.1283446E-03   0.2413405E-01   0.6638422E-04   0.4275015E-04   0.5600098E+01   0.1000000E+02   0.1000000E+06
  500 0.2603872E-03   0.6918740E-01   0.1754994E-03   0.5062335E-04   0.1026001E+02   0.1000000E+02   0.1000000E+06
  600 0.1247175E-03   0.4235843E-02   0.2421968E-03   0.6160150E-04   0.1552002E+02   0.1000000E+02   0.1000000E+06
  700 0.1646013E-03   0.5754821E-02   0.2835551E-03   0.6233337E-04   0.1938989E+02   0.1000000E+02   0.1000000E+06
  800 0.1927820E-03   0.4938678E-01   0.2941058E-03   0.8600553E-04   0.2896997E+02   0.1000000E+02   0.1000000E+06
```

```
  900 0.1166987E-03   0.6590737E-01   0.1594524E-03   0.1006875E-03   0.4637012E+02   0.1000000E+02   0.1000000E+06
 1000 0.1606602E-03   0.6945291E-01   0.1021613E-03   0.1012609E-03   0.5363037E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.1484621E-05   0.2163402E-04   0.8081969E-06   0.1297932E-04   0.2001953E-01   0.1000000E+02   0.1000000E+06
  200 0.1226514E-05   0.1353988E-04   0.6088453E-06   0.1837228E-04   0.2001953E+00   0.1000000E+02   0.1000000E+06
  300 0.1382073E-05   0.1294608E-04   0.6356939E-06   0.2889926E-04   0.1430176E+01   0.1000000E+02   0.1000000E+06
  400 0.2394201E-05   0.2050342E-03   0.2385933E-04   0.4071761E-04   0.6750000E+01   0.1000000E+02   0.1000000E+06
  500 0.3432267E-05   0.9634288E-04   0.9622922E-05   0.5120082E-04   0.1245996E+02   0.1000000E+02   0.1000000E+06
  600 0.2505643E-05   0.3853148E-03   0.3201300E-04   0.6306428E-04   0.1732959E+02   0.1000000E+02   0.1000000E+06
  700 0.2235487E-05   0.2566734E-03   0.2303029E-04   0.7246020E-04   0.2079980E+02   0.1000000E+02   0.1000000E+06
  800 0.4278590E-05   0.3079866E-03   0.2753242E-04   0.7738875E-04   0.2326025E+02   0.1000000E+02   0.1000000E+06
  900 0.7230855E-05   0.1465056E-03   0.1887835E-04   0.9047302E-04   0.3563965E+02   0.1000000E+02   0.1000000E+06
 1000 0.7868683E-05   0.1011392E-02   0.1198903E-03   0.9418754E-04   0.3729004E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.1288729E-05   0.1702298E-03   0.5753236E-06   0.9495661E-05   0.2978516E-01   0.1000000E+02   0.1000000E+06
  200 0.2060358E-04   0.4678504E-02   0.1028969E-04   0.1946604E-04   0.3999023E+00   0.1000000E+02   0.1000000E+06
  300 0.5736067E-05   0.3740668E-03   0.2538560E-05   0.2356087E-04   0.3770020E+01   0.1000000E+02   0.1000000E+06
  400 0.7827353E-04   0.2606050E-02   0.9808523E-04   0.3725116E-04   0.6790039E+01   0.1000000E+02   0.1000000E+06
  500 0.5458178E-05   0.8638471E-03   0.6450839E-04   0.5063902E-04   0.1232031E+02   0.1000000E+02   0.1000000E+06
  600 0.8831045E-04   0.4620651E-02   0.4756298E-03   0.5643574E-04   0.2048047E+02   0.1000000E+02   0.1000000E+06
  700 0.1282245E-03   0.4919425E-02   0.3508587E-03   0.6250621E-04   0.2558008E+02   0.1000000E+02   0.1000000E+06
  800 0.9819023E-04   0.2488067E-02   0.1582616E-03   0.8290745E-04   0.3883984E+02   0.1000000E+02   0.1000000E+06
  900 0.1299402E-03   0.6003063E-02   0.3129475E-03   0.9647628E-04   0.4857959E+02   0.1000000E+02   0.1000000E+06
 1000 0.4414621E-04   0.2990771E+00   0.8941027E-02   0.1149296E-03   0.4405029E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.5494415E-04   0.1273136E+00   0.3275554E-04   0.1020205E-04   0.4003906E-01   0.1000000E+02   0.1000000E+06
  200 0.1810975E-04   0.5318780E-01   0.9246286E-05   0.1789364E-04   0.3500977E+00   0.1000000E+02   0.1000000E+06
  300 0.3058071E-04   0.5065370E-01   0.1476688E-04   0.2696592E-04   0.2500000E+01   0.1000000E+02   0.1000000E+06
  400 0.5851979E-04   0.2057301E-01   0.1796190E-03   0.4055401E-04   0.9349609E+01   0.1000000E+02   0.1000000E+06
  500 0.5194526E-04   0.9541019E-02   0.7856862E-04   0.5129010E-04   0.1151025E+02   0.1000000E+02   0.1000000E+06
  600 0.8886732E-04   0.1495692E-01   0.3062207E-03   0.5556845E-04   0.1622021E+02   0.1000000E+02   0.1000000E+06
  700 0.1091659E-03   0.1183804E-01   0.1840917E-03   0.6219173E-04   0.4113965E+02   0.1000000E+02   0.1000000E+06
  800 0.1091051E-03   0.1531939E+00   0.2296429E-01   0.8088670E-04   0.4478027E+02   0.1000000E+02   0.1000000E+06
  900 0.9882354E-04   0.7556117E-01   0.2457231E-03   0.9518524E-04   0.5256006E+02   0.1000000E+02   0.1000000E+06
 1000 0.1162170E-03   0.1411274E-01   0.3783200E-03   0.1041085E-03   0.8468945E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.2455863E-05   0.6623383E-02   0.1423010E-05   0.1149636E-04   0.5957031E-01   0.1000000E+02   0.1000000E+06
  200 0.7732511E-04   0.5664116E-01   0.3730134E-04   0.2004178E-04   0.2500000E+00   0.1000000E+02   0.1000000E+06
  300 0.1425112E-04   0.1135567E+00   0.7221940E-05   0.3035164E-04   0.2469727E+01   0.1000000E+02   0.1000000E+06
  400 0.1378639E-04   0.9073319E-01   0.1378551E-04   0.4116673E-04   0.7110352E+01   0.1000000E+02   0.1000000E+06
  500 0.6476741E-04   0.4357949E-01   0.1728494E-03   0.4959674E-04   0.1313965E+02   0.1000000E+02   0.1000000E+06
  600 0.1632140E-03   0.5485084E-01   0.2652542E-03   0.6516335E-04   0.1937988E+02   0.1000000E+02   0.1000000E+06
  700 0.7456613E-04   0.9614883E-01   0.2412103E-03   0.6965430E-04   0.2048047E+02   0.1000000E+02   0.1000000E+06
  800 0.1085457E-03   0.2328660E+00   0.4585418E-01   0.8866459E-04   0.6272949E+02   0.1000000E+02   0.1000000E+06
  900 0.7063921E-04   0.5479232E-01   0.1485693E-03   0.1063889E-03   0.4970996E+02   0.1000000E+02   0.1000000E+06
 1000 0.5577592E-04   0.4117414E-01   0.2057803E-03   0.9896492E-04   0.5156934E+02   0.1000000E+02   0.1000000E+06
```

p=n/10 j0=n-p
del_min = sig_min = x_low = lambda_low = 0.1000000E+00

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.8402819E-05	0.7382684E-03	0.6135296E-04	0.9084829E-05	0.6054688E-01	0.1000000E+02	0.1000000E+06
200	0.6143393E-05	0.5637991E-03	0.5227015E-04	0.2092586E-04	0.3193359E+00	0.1000000E+02	0.1000000E+06
300	0.2051283E-04	0.6748209E-02	0.6484656E-03	0.3658270E-04	0.1379883E+01	0.1000000E+02	0.1000000E+06
400	0.1328548E-04	0.2697068E-02	0.2147384E-03	0.4040230E-04	0.5310547E+01	0.1000000E+02	0.1000000E+06
500	0.2138477E-04	0.3719087E-01	0.3570411E-02	0.5375949E-04	0.1807031E+02	0.1000000E+02	0.1000000E+06
600	0.1985248E-04	0.5568641E-01	0.4060121E-02	0.5560988E-04	0.3175977E+02	0.1000000E+02	0.1000000E+06
700	0.2886503E-04	0.1469535E-01	0.1635357E-02	0.6926276E-04	0.3674023E+02	0.1000000E+02	0.1000000E+06
800	0.3099844E-04	0.9959868E-01	0.8867454E-02	0.8063970E-04	0.5587988E+02	0.1000000E+02	0.1000000E+06
900	0.3466346E-04	0.6087943E-01	0.6357419E-02	0.8622215E-04	0.5533984E+02	0.1000000E+02	0.1000000E+06
1000	0.1721513E-04	0.2686093E-01	0.3660428E-02	0.9721432E-04	0.7153027E+02	0.1000000E+02	0.1000000E+06

p=n/10 j0=n-p
del_min = sig_min = x_low = lambda_low = 0.1000000E-01

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.3052791E-04	0.2040091E+00	0.2010664E-02	0.1040522E-04	0.6933594E-01	0.1000000E+02	0.1000000E+06
200	0.2027781E-04	0.1365365E-01	0.2415390E-03	0.2093744E-04	0.4902344E+00	0.1000000E+02	0.1000000E+06
300	0.2855933E-04	0.5767248E-01	0.2315874E-02	0.3816777E-04	0.5480469E+01	0.1000000E+02	0.1000000E+06
400	0.2358188E-04	0.1933835E-01	0.3005396E-03	0.3523764E-04	0.1181934E+02	0.1000000E+02	0.1000000E+06
500	0.2843476E-04	0.6859888E-01	0.1611496E-02	0.4911404E-04	0.2041992E+02	0.1000000E+02	0.1000000E+06
600	0.2904471E-04	0.2043907E-01	0.1224715E-02	0.6080469E-04	0.3595996E+02	0.1000000E+02	0.1000000E+06
700	0.2415030E-04	0.1040069E+00	0.3778058E-02	0.7220123E-04	0.4744922E+02	0.1000000E+02	0.1000000E+06
800	0.6356228E-04	0.9257671E-01	0.1502870E-02	0.7608112E-04	0.6640039E+02	0.1000000E+02	0.1000000E+06
900	0.2165547E-04	0.1381238E-01	0.5091171E-03	0.8366316E-04	0.9925000E+02	0.1000000E+02	0.1000000E+06
1000	0.4440768E-04	0.5509494E-01	0.1329308E-02	0.9450339E-04	0.1149795E+03	0.1000000E+02	0.1000000E+06

p=n/10 j0=n-p
del_min = sig_min = x_low = lambda_low = 0.1000000E-02

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.1954306E-04	0.2121686E+00	0.2493819E-03	0.6075850E-05	0.4980469E-01	0.1000000E+02	0.1000000E+06
200	0.2767263E-04	0.6920498E-01	0.3381237E-03	0.2052821E-04	0.9199219E+00	0.1000000E+02	0.1000000E+06
300	0.1633677E-04	0.5356286E-01	0.2190822E-03	0.3028452E-04	0.3330078E+01	0.1000000E+02	0.1000000E+06
400	0.1198473E-04	0.5198552E-01	0.3115340E-03	0.3927777E-04	0.1256055E+02	0.1000000E+02	0.1000000E+06
500	0.2083157E-04	0.2135488E-01	0.5391723E-03	0.4584480E-04	0.2430957E+02	0.1000000E+02	0.1000000E+06
600	0.1766602E-04	0.5117710E-01	0.6008133E-03	0.6069500E-04	0.3291992E+02	0.1000000E+02	0.1000000E+06
700	0.4014246E-04	0.9248835E-01	0.2141452E-02	0.6498422E-04	0.3537012E+02	0.1000000E+02	0.1000000E+06
800	0.1966521E-04	0.9379408E-01	0.5933138E-03	0.7681159E-04	0.7580957E+02	0.1000000E+02	0.1000000E+06
900	0.4223876E-04	0.6858065E-01	0.1903270E-02	0.9717488E-04	0.1143799E+03	0.1000000E+02	0.1000000E+06
1000	0.2964044E-04	0.1080884E+00	0.1148603E-02	0.9697426E-04	0.1099902E+03	0.1000000E+02	0.1000000E+06

p=n/10 j0=n-p
del_min = sig_min = x_low = lambda_low = 0.1000000E-03

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.3498435E-05	0.8241910E-01	0.4376769E-04	0.5838521E-05	0.5078125E-01	0.1000000E+02	0.1000000E+06
200	0.3439366E-05	0.1210742E+00	0.3581451E-04	0.1916014E-04	0.3691406E+00	0.1000000E+02	0.1000000E+06
300	0.9858645E-05	0.1831242E+00	0.3046242E-03	0.2985335E-04	0.2259766E+01	0.1000000E+02	0.1000000E+06
400	0.4545574E-04	0.7289963E-01	0.1604821E-02	0.3846693E-04	0.1470996E+02	0.1000000E+02	0.1000000E+06
500	0.3243058E-04	0.6019953E-01	0.1798664E-02	0.5247828E-04	0.2836035E+02	0.1000000E+02	0.1000000E+06
600	0.5266576E-04	0.1209323E+00	0.8938135E-03	0.5207943E-04	0.2937012E+02	0.1000000E+02	0.1000000E+06
700	0.3302941E-04	0.1238090E+00	0.1591068E-02	0.6757637E-04	0.5802051E+02	0.1000000E+02	0.1000000E+06
800	0.1775399E-04	0.6374629E-01	0.2087389E-03	0.7505577E-04	0.6101074E+02	0.1000000E+02	0.1000000E+06
900	0.1181010E-04	0.6585347E-01	0.2041891E-02	0.9342268E-04	0.9888965E+02	0.1000000E+02	0.1000000E+06
1000	0.3767001E-04	0.1041676E+00	0.1543153E-02	0.1008451E-03	0.1011094E+03	0.1000000E+02	0.1000000E+06

p=n/2 j0=(n-p)/4
del_min = sig_min = x_low = lambda_low = 0.1000000E+00

```
# n=       x_err          mu_err          l_err       infeasibility    time used     penalty_param   smoothing_param
  100 0.6624769E-05   0.1641204E-03   0.2712961E-04   0.4886664E-04   0.3798828E+00   0.1000000E+02   0.1000000E+06
  200 0.2950376E-04   0.5296771E-03   0.1212656E-03   0.1070242E-03   0.1700195E+01   0.1000000E+02   0.1000000E+06
  300 0.4380116E-04   0.7526883E-03   0.1743377E-03   0.1707400E-03   0.4570312E+01   0.1000000E+02   0.1000000E+06
  400 0.4005504E-04   0.9902294E-03   0.2635086E-03   0.1841995E-03   0.8160156E+01   0.1000000E+02   0.1000000E+06
  500 0.3629397E-04   0.3477476E-03   0.9003736E-04   0.2332180E-03   0.1383984E+02   0.1000000E+02   0.1000000E+06
  600 0.4750137E-04   0.1181298E-02   0.2999773E-03   0.3012859E-03   0.1890039E+02   0.1000000E+02   0.1000000E+06
  700 0.4249607E-04   0.7814195E-03   0.1841937E-03   0.3559700E-03   0.2716016E+02   0.1000000E+02   0.1000000E+06
  800 0.4681909E-04   0.1349624E-02   0.3357728E-03   0.4223890E-03   0.3465039E+02   0.1000000E+02   0.1000000E+06
  900 0.5115517E-04   0.8495055E-03   0.2021178E-03   0.4533820E-03   0.4778027E+02   0.1000000E+02   0.1000000E+06
 1000 0.1514024E-04   0.2814497E-03   0.6462019E-04   0.4806505E-03   0.6016016E+02   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err          mu_err          l_err       infeasibility    time used     penalty_param   smoothing_param
  100 0.8119693E-03   0.4716129E-02   0.6920642E-03   0.4837233E-04   0.6699219E+00   0.1000000E+02   0.1000000E+06
  200 0.5942128E-03   0.3234306E-02   0.4020478E-03   0.9665683E-04   0.2910156E+01   0.1000000E+02   0.1000000E+06
  300 0.4570672E-03   0.4892997E-02   0.4389748E-03   0.1532419E-03   0.6789062E+01   0.1000000E+02   0.1000000E+06
  400 0.5255886E-03   0.4517227E-02   0.7562276E-03   0.1973668E-03   0.1502930E+02   0.1000000E+02   0.1000000E+06
  500 0.3380669E-03   0.2506728E-02   0.3719484E-03   0.2311666E-03   0.1995117E+02   0.1000000E+02   0.1000000E+06
  600 0.3718292E-03   0.2761979E-02   0.3263005E-03   0.2988291E-03   0.2867969E+02   0.1000000E+02   0.1000000E+06
  700 0.5474766E-03   0.4530148E-02   0.5130898E-03   0.3434543E-03   0.4072852E+02   0.1000000E+02   0.1000000E+06
  800 0.4970275E-03   0.5650127E-02   0.8320950E-03   0.4086907E-03   0.5878125E+02   0.1000000E+02   0.1000000E+06
  900 0.3458180E-03   0.2708824E-02   0.4101539E-03   0.4341904E-03   0.6775977E+02   0.1000000E+02   0.1000000E+06
 1000 0.3901756E-03   0.4372414E-02   0.7052542E-03   0.4879028E-03   0.8303906E+02   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err          mu_err          l_err       infeasibility    time used     penalty_param   smoothing_param
  100 0.2762264E-03   0.8468667E-01   0.2734836E-03   0.4414019E-04   0.5800781E+00   0.1000000E+02   0.1000000E+06
  200 0.3606862E-03   0.9266324E-01   0.1501969E-02   0.9381585E-04   0.2359375E+01   0.1000000E+02   0.1000000E+06
  300 0.4415018E-03   0.7629742E-01   0.2369448E-02   0.1475772E-03   0.8380859E+01   0.1000000E+02   0.1000000E+06
  400 0.5449288E-03   0.1107536E-01   0.6046748E-03   0.1867890E-03   0.1567969E+02   0.1000000E+02   0.1000000E+06
  500 0.3997265E-03   0.6039682E-01   0.6902336E-03   0.2436371E-03   0.1730078E+02   0.1000000E+02   0.1000000E+06
  600 0.4141086E-03   0.2473925E-01   0.1357349E-02   0.2922409E-03   0.2641992E+02   0.1000000E+02   0.1000000E+06
  700 0.4694106E-03   0.5137365E-01   0.1505755E-02   0.3580922E-03   0.4691016E+02   0.1000000E+02   0.1000000E+06
  800 0.3641451E-03   0.6118132E-01   0.6589205E-03   0.3851077E-03   0.5991016E+02   0.1000000E+02   0.1000000E+06
  900 0.3903207E-03   0.1744885E-01   0.5591968E-03   0.4379871E-03   0.8464062E+02   0.1000000E+02   0.1000000E+06
 1000 0.3561392E-03   0.4973376E-01   0.2095578E-02   0.5003651E-03   0.8798047E+02   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err          mu_err          l_err       infeasibility    time used     penalty_param   smoothing_param
  100 0.4266032E-03   0.8658927E-02   0.2719341E-03   0.4981278E-04   0.4101562E+00   0.1000000E+02   0.1000000E+06
  200 0.3882981E-03   0.9003384E-02   0.5650851E-03   0.1038797E-03   0.2119141E+01   0.1000000E+02   0.1000000E+06
  300 0.4785037E-03   0.2789594E-01   0.1049066E-02   0.1576484E-03   0.5750000E+01   0.1000000E+02   0.1000000E+06
  400 0.5442154E-03   0.4627610E-01   0.7095006E-03   0.2045344E-03   0.1125000E+02   0.1000000E+02   0.1000000E+06
  500 0.3935434E-03   0.6679799E-01   0.4806618E-03   0.2296254E-03   0.2352148E+02   0.1000000E+02   0.1000000E+06
  600 0.3789721E-03   0.1780425E-01   0.3658338E-03   0.2972116E-03   0.2592969E+02   0.1000000E+02   0.1000000E+06
  700 0.4416395E-03   0.5772675E-02   0.6122555E-03   0.3480033E-03   0.4308008E+02   0.1000000E+02   0.1000000E+06
  800 0.5230821E-03   0.2137487E-01   0.6958676E-03   0.4097458E-03   0.5417969E+02   0.1000000E+02   0.1000000E+06
  900 0.4096561E-03   0.8569118E-01   0.1183564E-02   0.4571023E-03   0.7084961E+02   0.1000000E+02   0.1000000E+06
 1000 0.6781203E-03   0.4720388E-02   0.4269322E-03   0.4819735E-03   0.9922852E+02   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err          mu_err          l_err       infeasibility    time used     penalty_param   smoothing_param
  100 0.1918123E-04   0.2082289E-03   0.5327374E-04   0.5010095E-04   0.4316406E+00   0.1000000E+02   0.1000000E+06
  200 0.5513238E-04   0.6535256E-03   0.1648934E-03   0.8836797E-04   0.1810547E+01   0.1000000E+02   0.1000000E+06
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  300 0.5728379E-04   0.1084052E-02   0.2299878E-03   0.1470246E-03   0.4910156E+01   0.1000000E+02   0.1000000E+06
  400 0.7705572E-04   0.1957658E-02   0.5015544E-03   0.2010451E-03   0.9228516E+01   0.1000000E+02   0.1000000E+06
  500 0.4678490E-04   0.6897998E-03   0.1592644E-03   0.2463546E-03   0.1383984E+02   0.1000000E+02   0.1000000E+06
  600 0.4485483E-04   0.3545539E-03   0.9026264E-04   0.2874179E-03   0.2166992E+02   0.1000000E+02   0.1000000E+06
  700 0.5671592E-04   0.5215460E-03   0.1683142E-03   0.3470749E-03   0.2991016E+02   0.1000000E+02   0.1000000E+06
  800 0.5130339E-04   0.6607525E-03   0.1613348E-03   0.3993127E-03   0.3833984E+02   0.1000000E+02   0.1000000E+06
  900 0.6850248E-04   0.1129580E-02   0.2721244E-03   0.4592870E-03   0.5118945E+02   0.1000000E+02   0.1000000E+06
 1000 0.7028579E-04   0.1513547E-02   0.3940143E-03   0.5349286E-03   0.6414062E+02   0.1000000E+02   0.1000000E+06
```

```
#  p=n/2   j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=        x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.2548029E-03   0.7427382E-02   0.1230650E-02   0.4562045E-04   0.6289062E+00   0.1000000E+02   0.1000000E+06
  200 0.2184929E-03   0.4247023E-02   0.4825455E-03   0.1085700E-03   0.2988281E+01   0.1000000E+02   0.1000000E+06
  300 0.9835006E-04   0.2616806E-02   0.4823386E-03   0.1507877E-03   0.6808594E+01   0.1000000E+02   0.1000000E+06
  400 0.1873485E-03   0.3310855E-02   0.5823100E-03   0.2020278E-03   0.1703906E+02   0.1000000E+02   0.1000000E+06
  500 0.2656366E-03   0.5690721E-02   0.8181753E-03   0.2367975E-03   0.2260156E+02   0.1000000E+02   0.1000000E+06
  600 0.1931832E-03   0.4537898E-02   0.8286688E-03   0.2954950E-03   0.3941992E+02   0.1000000E+02   0.1000000E+06
  700 0.1809829E-03   0.2760874E-02   0.4781399E-03   0.3577492E-03   0.5253125E+02   0.1000000E+02   0.1000000E+06
  800 0.2017589E-03   0.4018424E-02   0.5251410E-03   0.4002015E-03   0.6539844E+02   0.1000000E+02   0.1000000E+06
  900 0.1736758E-03   0.2985018E-02   0.4019822E-03   0.4536665E-03   0.7829102E+02   0.1000000E+02   0.1000000E+06
 1000 0.2663591E-03   0.6585625E-02   0.6893338E-03   0.5183022E-03   0.1166992E+03   0.1000000E+02   0.1000000E+06
```

```
#  p=n/2   j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=        x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.4415885E-03   0.5697267E-01   0.1767863E-02   0.5047502E-04   0.5800781E+00   0.1000000E+02   0.1000000E+06
  200 0.2179856E-03   0.4896094E-02   0.7423802E-03   0.9856501E-04   0.2701172E+01   0.1000000E+02   0.1000000E+06
  300 0.3408993E-03   0.4684104E-01   0.9344971E-03   0.1568720E-03   0.5789062E+01   0.1000000E+02   0.1000000E+06
  400 0.2498267E-03   0.6108994E-01   0.1228867E-02   0.2068456E-03   0.1209961E+02   0.1000000E+02   0.1000000E+06
  500 0.2074312E-03   0.5043285E-01   0.1791439E-02   0.2417511E-03   0.2893164E+02   0.1000000E+02   0.1000000E+06
  600 0.2642762E-03   0.5070836E-01   0.2493349E-02   0.3090733E-03   0.3581055E+02   0.1000000E+02   0.1000000E+06
  700 0.3096429E-03   0.4677549E-01   0.9162773E-03   0.3420538E-03   0.4675977E+02   0.1000000E+02   0.1000000E+06
  800 0.2458681E-03   0.8451417E-01   0.2934391E-02   0.4165192E-03   0.5258984E+02   0.1000000E+02   0.1000000E+06
  900 0.1887375E-03   0.2789309E-01   0.9902693E-03   0.4633025E-03   0.1031406E+03   0.1000000E+02   0.1000000E+06
 1000 0.2492748E-03   0.6157262E-01   0.8872575E-03   0.5003146E-03   0.1015996E+03   0.1000000E+02   0.1000000E+06
```

```
#  p=n/2   j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=        x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.4133104E-03   0.8485951E-01   0.2442575E-02   0.5504530E-04   0.1009766E+01   0.1000000E+02   0.1000000E+06
  200 0.3003326E-03   0.9201497E-01   0.1262452E-02   0.1000414E-03   0.2431641E+01   0.1000000E+02   0.1000000E+06
  300 0.2048689E-03   0.7140855E-01   0.1748530E-02   0.1605488E-03   0.9050781E+01   0.1000000E+02   0.1000000E+06
  400 0.2270310E-03   0.3303194E-01   0.6270673E-03   0.1991241E-03   0.1270898E+02   0.1000000E+02   0.1000000E+06
  500 0.1849301E-03   0.4363016E-01   0.3991426E-03   0.2515490E-03   0.3156836E+02   0.1000000E+02   0.1000000E+06
  600 0.3995467E-03   0.1131102E-01   0.6609984E-03   0.2864020E-03   0.3662109E+02   0.1000000E+02   0.1000000E+06
  700 0.2468710E-03   0.6180515E-01   0.1431633E-02   0.3588795E-03   0.4232031E+02   0.1000000E+02   0.1000000E+06
  800 0.2110652E-03   0.2581648E-01   0.4956508E-03   0.4080074E-03   0.7411914E+02   0.1000000E+02   0.1000000E+06
  900 0.2614862E-03   0.3773307E-01   0.9628983E-03   0.4492313E-03   0.9738867E+02   0.1000000E+02   0.1000000E+06
 1000 0.1583226E-03   0.3584518E-01   0.9888385E-03   0.5008491E-03   0.9692969E+02   0.1000000E+02   0.1000000E+06
```

```
#  p=n/2   j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=        x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.3253948E-04   0.3122448E-02   0.6712643E-03   0.4868266E-04   0.1150391E+01   0.1000000E+02   0.1000000E+06
  200 0.7624318E-04   0.3954280E-01   0.1018926E-01   0.1041036E-03   0.3929688E+01   0.1000000E+02   0.1000000E+06
  300 0.7596247E-04   0.6418522E-01   0.1438214E-01   0.1486279E-03   0.8099609E+01   0.1000000E+02   0.1000000E+06
  400 0.3443657E-04   0.4765959E-01   0.1160182E-01   0.1910651E-03   0.1369922E+02   0.1000000E+02   0.1000000E+06
  500 0.5428343E-04   0.6124827E-01   0.1415282E-01   0.2448233E-03   0.3016992E+02   0.1000000E+02   0.1000000E+06
```

```
  600 0.5009473E-04   0.3960167E-01   0.8596908E-02   0.2887873E-03   0.4203125E+02   0.1000000E+02   0.1000000E+06
  700 0.3056888E-04   0.1968699E-01   0.4347156E-02   0.3518860E-03   0.4800977E+02   0.1000000E+02   0.1000000E+06
  800 0.5132454E-04   0.1982437E-01   0.4874566E-02   0.3906037E-03   0.8275000E+02   0.1000000E+02   0.1000000E+06
  900 0.5331640E-04   0.2581341E-01   0.6029731E-02   0.4668645E-03   0.8932031E+02   0.1000000E+02   0.1000000E+06
 1000 0.2565349E-04   0.1860851E-01   0.3633143E-02   0.4989861E-03   0.1084102E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.1077831E-03   0.1118438E+00   0.3735347E-02   0.5288474E-04   0.9492188E+00   0.1000000E+02   0.1000000E+06
  200 0.4441841E-04   0.7744671E-01   0.6602289E-02   0.1040716E-03   0.3449219E+01   0.1000000E+02   0.1000000E+06
  300 0.6540839E-04   0.4677320E-01   0.3651736E-02   0.1475696E-03   0.1196875E+02   0.1000000E+02   0.1000000E+06
  400 0.4119941E-04   0.2660874E-01   0.4110917E-02   0.1919463E-03   0.1888867E+02   0.1000000E+02   0.1000000E+06
  500 0.8644775E-04   0.2660882E-01   0.2055062E-02   0.2509331E-03   0.3625000E+02   0.1000000E+02   0.1000000E+06
  600 0.1010764E-03   0.9236018E-01   0.5198296E-02   0.2937866E-03   0.4250977E+02   0.1000000E+02   0.1000000E+06
  700 0.8067992E-04   0.6654860E-01   0.5449543E-02   0.3406718E-03   0.6860938E+02   0.1000000E+02   0.1000000E+06
  800 0.1119875E-03   0.4752960E-01   0.3615433E-02   0.3985466E-03   0.1445430E+03   0.1000000E+02   0.1000000E+06
  900 0.6551480E-04   0.4926357E-01   0.3472903E-02   0.4624569E-03   0.1681289E+03   0.1000000E+02   0.1000000E+06
 1000 0.8919064E-04   0.4952487E-01   0.2801029E-02   0.4816554E-03   0.1763398E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.2071684E-04   0.5177399E-01   0.2980909E-03   0.5416204E-04   0.6914062E+00   0.1000000E+02   0.1000000E+06
  200 0.1272057E-03   0.1029336E+00   0.4723115E-02   0.9624222E-04   0.4250000E+01   0.1000000E+02   0.1000000E+06
  300 0.9382581E-04   0.8108830E-01   0.3492750E-02   0.1584166E-03   0.9687500E+01   0.1000000E+02   0.1000000E+06
  400 0.6001361E-04   0.7853696E-01   0.2547615E-02   0.2079077E-03   0.1847266E+02   0.1000000E+02   0.1000000E+06
  500 0.5263921E-04   0.1031943E+00   0.4781799E-02   0.2500124E-03   0.3687109E+02   0.1000000E+02   0.1000000E+06
  600 0.9439698E-04   0.4106402E-01   0.1839519E-02   0.3082658E-03   0.4041797E+02   0.1000000E+02   0.1000000E+06
  700 0.5964756E-04   0.4454613E-01   0.2401848E-02   0.3358177E-03   0.1046992E+03   0.1000000E+02   0.1000000E+06
  800 0.8865858E-04   0.6147140E-01   0.1917202E-02   0.3882301E-03   0.1083828E+03   0.1000000E+02   0.1000000E+06
  900 0.7707142E-04   0.4896122E-01   0.1130967E-02   0.4584540E-03   0.1991406E+03   0.1000000E+02   0.1000000E+06
 1000 0.9528401E-04   0.7118792E-01   0.2710383E-02   0.5038307E-03   0.1397500E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.4262054E-04   0.1519923E-01   0.6235697E-03   0.5235845E-04   0.8906250E+00   0.1000000E+02   0.1000000E+06
  200 0.1244581E-03   0.1122023E+00   0.4195665E-02   0.9674818E-04   0.5511719E+01   0.1000000E+02   0.1000000E+06
  300 0.5560038E-04   0.6289162E-01   0.2260668E-02   0.1505847E-03   0.8910156E+01   0.1000000E+02   0.1000000E+06
  400 0.1367038E-03   0.1239001E+00   0.2963819E-02   0.2238189E-03   0.2753125E+02   0.1000000E+02   0.1000000E+06
  500 0.1274093E-03   0.8762956E-01   0.3746043E-02   0.2702746E-03   0.3215234E+02   0.1000000E+02   0.1000000E+06
  600 0.4178927E-04   0.9733395E-01   0.2287222E-02   0.3047032E-03   0.5205859E+02   0.1000000E+02   0.1000000E+06
  700 0.7293820E-04   0.4675993E-01   0.1066704E-02   0.3471304E-03   0.9704297E+02   0.1000000E+02   0.1000000E+06
  800 0.9180262E-04   0.4028909E-01   0.2256732E-02   0.4000632E-03   0.1119805E+03   0.1000000E+02   0.1000000E+06
  900 0.6996249E-04   0.5578015E-01   0.2626190E-02   0.4470919E-03   0.1696406E+03   0.1000000E+02   0.1000000E+06
 1000 0.6785330E-04   0.3754919E-01   0.2805598E-02   0.5226826E-03   0.2665977E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.6504828E-04   0.1051663E-02   0.2631052E-03   0.7716648E-04   0.4101562E+00   0.1000000E+02   0.1000000E+06
  200 0.4281102E-04   0.1904236E-02   0.5082029E-03   0.1386090E-03   0.2199219E+01   0.1000000E+02   0.1000000E+06
  300 0.6651895E-04   0.8140017E-03   0.2017988E-03   0.2064080E-03   0.6058594E+01   0.1000000E+02   0.1000000E+06
  400 0.6241133E-04   0.1096361E-02   0.3432393E-03   0.2985397E-03   0.9539062E+01   0.1000000E+02   0.1000000E+06
  500 0.6020850E-04   0.7648002E-03   0.2174839E-03   0.3386746E-03   0.1646875E+02   0.1000000E+02   0.1000000E+06
  600 0.4493671E-04   0.2446640E-02   0.6039759E-03   0.4148697E-03   0.2573047E+02   0.1000000E+02   0.1000000E+06
  700 0.3233548E-04   0.1636905E-03   0.4909143E-04   0.5042729E-03   0.3192969E+02   0.1000000E+02   0.1000000E+06
  800 0.5083644E-04   0.5025059E-03   0.1436854E-03   0.5668242E-03   0.4317188E+02   0.1000000E+02   0.1000000E+06
```

900	0.7049783E-04	0.1675378E-02	0.4969343E-03	0.6079221E-03	0.5647266E+02	0.1000000E+02	0.1000000E+06
1000	0.5921736E-04	0.9840429E-03	0.2868041E-03	0.7018807E-03	0.7007031E+02	0.1000000E+02	0.1000000E+06

p=7n/10 j0=(n-p)/4
del_min = sig_min = x_low = lambda_low = 0.1000000E-01

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.9893306E-03	0.1105243E-01	0.1764401E-02	0.7696036E-04	0.5585938E+00	0.1000000E+02	0.1000000E+06
200	0.2493471E-03	0.2868019E-02	0.5932734E-03	0.1408791E-03	0.3406250E+01	0.1000000E+02	0.1000000E+06
300	0.3969967E-03	0.2666339E-02	0.3971370E-03	0.2094978E-03	0.7613281E+01	0.1000000E+02	0.1000000E+06
400	0.2629857E-03	0.3143244E-02	0.6143047E-03	0.2805942E-03	0.1260156E+02	0.1000000E+02	0.1000000E+06
500	0.3188862E-03	0.1851699E-02	0.3166503E-03	0.3400505E-03	0.2560938E+02	0.1000000E+02	0.1000000E+06
600	0.2994578E-03	0.2550211E-02	0.3860035E-03	0.4321915E-03	0.3357031E+02	0.1000000E+02	0.1000000E+06
700	0.4804360E-03	0.6030832E-02	0.1216432E-02	0.4887964E-03	0.4192188E+02	0.1000000E+02	0.1000000E+06
800	0.3721381E-03	0.3574348E-02	0.6411540E-03	0.5809402E-03	0.7954297E+02	0.1000000E+02	0.1000000E+06
900	0.3976689E-03	0.3585350E-02	0.6720821E-03	0.6592894E-03	0.9301953E+02	0.1000000E+02	0.1000000E+06
1000	0.5204020E-03	0.5412210E-02	0.7481088E-03	0.7107304E-03	0.1124766E+03	0.1000000E+02	0.1000000E+06

p=7n/10 j0=(n-p)/4
del_min = sig_min = x_low = lambda_low = 0.1000000E-02

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.2637515E-03	0.2382635E-01	0.4363364E-03	0.6984722E-04	0.4687500E+00	0.1000000E+02	0.1000000E+06
200	0.2969196E-03	0.1181571E+00	0.1986316E-02	0.1412091E-03	0.2882812E+01	0.1000000E+02	0.1000000E+06
300	0.2130817E-03	0.6802730E-02	0.3411065E-03	0.1996440E-03	0.1071875E+02	0.1000000E+02	0.1000000E+06
400	0.5053108E-03	0.1262355E-01	0.4771898E-03	0.2662091E-03	0.1377734E+02	0.1000000E+02	0.1000000E+06
500	0.5322074E-03	0.2535547E-01	0.5446135E-03	0.3577182E-03	0.3210938E+02	0.1000000E+02	0.1000000E+06
600	0.5727332E-03	0.2822067E-01	0.1617549E-02	0.4148726E-03	0.3002734E+02	0.1000000E+02	0.1000000E+06
700	0.2702484E-03	0.2254487E-01	0.1156510E-02	0.4940332E-03	0.4503125E+02	0.1000000E+02	0.1000000E+06
800	0.6324072E-03	0.1371395E-01	0.6571444E-03	0.5354763E-03	0.6375781E+02	0.1000000E+02	0.1000000E+06
900	0.6208939E-03	0.4503298E-01	0.1154263E-02	0.6377811E-03	0.1048711E+03	0.1000000E+02	0.1000000E+06
1000	0.3581690E-03	0.2190195E-01	0.7388608E-03	0.6895207E-03	0.1240391E+03	0.1000000E+02	0.1000000E+06

p=7n/10 j0=(n-p)/4
del_min = sig_min = x_low = lambda_low = 0.1000000E-03

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.3318425E-03	0.1041293E+00	0.9468275E-03	0.6567243E-04	0.7109375E+00	0.1000000E+02	0.1000000E+06
200	0.1593025E-03	0.4316102E-01	0.1129993E-02	0.1556353E-03	0.4023438E+01	0.1000000E+02	0.1000000E+06
300	0.1139337E-02	0.1242078E+00	0.1819714E-02	0.2081538E-03	0.1608984E+02	0.1000000E+02	0.1000000E+06
400	0.9411977E-03	0.8153872E-01	0.1617877E-02	0.2850157E-03	0.1595312E+02	0.1000000E+02	0.1000000E+06
500	0.5300209E-03	0.1103213E-01	0.7756709E-03	0.3621941E-03	0.2691016E+02	0.1000000E+02	0.1000000E+06
600	0.3310842E-03	0.8012280E-01	0.2321453E-02	0.4366372E-03	0.3216016E+02	0.1000000E+02	0.1000000E+06
700	0.4600024E-03	0.4234398E-01	0.1171922E-02	0.4959800E-03	0.4612891E+02	0.1000000E+02	0.1000000E+06
800	0.2488324E-03	0.3166683E-01	0.3455431E-03	0.5742432E-03	0.7321875E+02	0.1000000E+02	0.1000000E+06
900	0.3478634E-03	0.4207396E-01	0.1469401E-02	0.6372737E-03	0.8686328E+02	0.1000000E+02	0.1000000E+06
1000	0.3909086E-03	0.3058185E-01	0.6151118E-03	0.6987279E-03	0.1022695E+03	0.1000000E+02	0.1000000E+06

p=7n/10 j0=(n-p)/2
del_min = sig_min = x_low = lambda_low = 0.1000000E+00

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.1013688E-04	0.3036224E-03	0.6212442E-04	0.6733298E-04	0.4726562E+00	0.1000000E+02	0.1000000E+06
200	0.5629816E-04	0.1148850E-02	0.3309675E-03	0.1387153E-03	0.2292969E+01	0.1000000E+02	0.1000000E+06
300	0.9419701E-04	0.1114886E-02	0.2954802E-03	0.2088775E-03	0.5832031E+01	0.1000000E+02	0.1000000E+06
400	0.6195391E-04	0.1045285E-02	0.3022632E-03	0.2992127E-03	0.1123047E+02	0.1000000E+02	0.1000000E+06
500	0.6140601E-04	0.8222965E-03	0.1950938E-03	0.3447026E-03	0.1669141E+02	0.1000000E+02	0.1000000E+06
600	0.6558159E-04	0.8797530E-03	0.2356169E-03	0.4338924E-03	0.2607812E+02	0.1000000E+02	0.1000000E+06
700	0.6173865E-04	0.1128135E-02	0.3053209E-03	0.4877966E-03	0.3266797E+02	0.1000000E+02	0.1000000E+06
800	0.5707783E-04	0.5007935E-03	0.1407720E-03	0.5764579E-03	0.5099219E+02	0.1000000E+02	0.1000000E+06
900	0.6416844E-04	0.5976045E-03	0.1745786E-03	0.6160764E-03	0.6069922E+02	0.1000000E+02	0.1000000E+06
1000	0.7120168E-04	0.1635408E-02	0.4085733E-03	0.7080476E-03	0.7483984E+02	0.1000000E+02	0.1000000E+06

```
#  p=7n/10 j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err          l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.1486233E-03   0.1015974E-02   0.2719715E-03   0.7747617E-04   0.8281250E+00   0.1000000E+02   0.1000000E+06
  200 0.2135269E-03   0.3393152E-02   0.7388656E-03   0.1478455E-03   0.2949219E+01   0.1000000E+02   0.1000000E+06
  300 0.1620425E-03   0.2382673E-02   0.5711290E-03   0.2121033E-03   0.9121094E+01   0.1000000E+02   0.1000000E+06
  400 0.2748169E-03   0.3796000E-02   0.6241894E-03   0.2722652E-03   0.1565234E+02   0.1000000E+02   0.1000000E+06
  500 0.2567948E-03   0.3407873E-02   0.6578027E-03   0.3544151E-03   0.2869141E+02   0.1000000E+02   0.1000000E+06
  600 0.1772773E-03   0.3893348E-02   0.7835949E-03   0.4076738E-03   0.3373047E+02   0.1000000E+02   0.1000000E+06
  700 0.3171709E-03   0.4018186E-02   0.7720238E-03   0.4818050E-03   0.5301953E+02   0.1000000E+02   0.1000000E+06
  800 0.1937285E-03   0.3954151E-02   0.7103173E-03   0.5759547E-03   0.7187891E+02   0.1000000E+02   0.1000000E+06
  900 0.2227119E-03   0.3465766E-02   0.5974683E-03   0.6506492E-03   0.1104922E+03   0.1000000E+02   0.1000000E+06
 1000 0.2394324E-03   0.3875342E-02   0.7038841E-03   0.7129106E-03   0.1094609E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err          l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.1221418E-03   0.7754098E-02   0.5181342E-03   0.6843060E-04   0.6210938E+00   0.1000000E+02   0.1000000E+06
  200 0.1162614E-03   0.3109138E-01   0.7883156E-03   0.1463912E-03   0.3789062E+01   0.1000000E+02   0.1000000E+06
  300 0.2188392E-03   0.4285959E-01   0.1723091E-02   0.2233362E-03   0.1162109E+02   0.1000000E+02   0.1000000E+06
  400 0.2126039E-03   0.1184035E-01   0.5959586E-03   0.2990475E-03   0.1516016E+02   0.1000000E+02   0.1000000E+06
  500 0.2411461E-03   0.1732036E-01   0.7872930E-03   0.3637410E-03   0.3305859E+02   0.1000000E+02   0.1000000E+06
  600 0.1697348E-03   0.2043257E-01   0.1564354E-02   0.4212158E-03   0.4026953E+02   0.1000000E+02   0.1000000E+06
  700 0.3355332E-03   0.6767449E-01   0.2407134E-02   0.5122461E-03   0.6241016E+02   0.1000000E+02   0.1000000E+06
  800 0.2390719E-03   0.7118134E-01   0.2547007E-02   0.5725822E-03   0.6615234E+02   0.1000000E+02   0.1000000E+06
  900 0.2783323E-03   0.3306615E-01   0.1356722E-02   0.6255495E-03   0.9282031E+02   0.1000000E+02   0.1000000E+06
 1000 0.3118263E-03   0.5215691E-01   0.1641815E-02   0.7071668E-03   0.1131602E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err          l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.1873432E-03   0.1195444E+00   0.2904977E-03   0.6847830E-04   0.4726562E+00   0.1000000E+02   0.1000000E+06
  200 0.2002353E-03   0.6282806E-01   0.7196046E-03   0.1437706E-03   0.3347656E+01   0.1000000E+02   0.1000000E+06
  300 0.2153621E-03   0.8043124E-01   0.1615601E-02   0.2060978E-03   0.8031250E+01   0.1000000E+02   0.1000000E+06
  400 0.2142076E-03   0.6521215E-01   0.2132150E-02   0.2912839E-03   0.2251953E+02   0.1000000E+02   0.1000000E+06
  500 0.2616619E-03   0.4541710E-01   0.9298409E-03   0.3570600E-03   0.2119922E+02   0.1000000E+02   0.1000000E+06
  600 0.2630776E-03   0.2009035E-01   0.4517889E-03   0.4161905E-03   0.3711328E+02   0.1000000E+02   0.1000000E+06
  700 0.2818951E-03   0.8073005E-01   0.2054616E-02   0.4918186E-03   0.6223828E+02   0.1000000E+02   0.1000000E+06
  800 0.2142057E-03   0.6811439E-01   0.2746578E-02   0.5645971E-03   0.8771094E+02   0.1000000E+02   0.1000000E+06
  900 0.2529312E-03   0.7407876E-01   0.2300315E-02   0.6309751E-03   0.8733984E+02   0.1000000E+02   0.1000000E+06
 1000 0.1788371E-03   0.3201631E-01   0.8376467E-03   0.6916422E-03   0.1191289E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err          l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.7541625E-05   0.1810619E-03   0.5282148E-04   0.6676195E-04   0.1132812E+01   0.1000000E+02   0.1000000E+06
  200 0.3081745E-04   0.1767484E-01   0.4493488E-02   0.1309163E-03   0.5171875E+01   0.1000000E+02   0.1000000E+06
  300 0.1053700E-03   0.3974744E-01   0.1021610E-01   0.2255261E-03   0.9089844E+01   0.1000000E+02   0.1000000E+06
  400 0.1801715E-04   0.1368260E-01   0.3840608E-02   0.2794189E-03   0.2226953E+02   0.1000000E+02   0.1000000E+06
  500 0.3300044E-04   0.2215316E-01   0.6269096E-02   0.3519966E-03   0.2742969E+02   0.1000000E+02   0.1000000E+06
  600 0.4244628E-04   0.2093461E-01   0.5452396E-02   0.4260237E-03   0.4463281E+02   0.1000000E+02   0.1000000E+06
  700 0.6468047E-04   0.5121465E-01   0.1271095E-01   0.4902582E-03   0.5684766E+02   0.1000000E+02   0.1000000E+06
  800 0.2599548E-04   0.2038648E-01   0.5895218E-02   0.5684071E-03   0.9815234E+02   0.1000000E+02   0.1000000E+06
  900 0.6135690E-04   0.4752424E-01   0.1298750E-01   0.6368715E-03   0.1132500E+03   0.1000000E+02   0.1000000E+06
 1000 0.8428248E-04   0.6350421E-01   0.1725088E-01   0.7043341E-03   0.1537500E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
```

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.4011327E-04	0.4170399E-01	0.2359075E-02	0.6981272E-04	0.5390625E+00	0.1000000E+02	0.1000000E+06
200	0.1694166E-03	0.3866169E-01	0.1413344E-02	0.1470949E-03	0.3871094E+01	0.1000000E+02	0.1000000E+06
300	0.6720235E-04	0.2915817E-01	0.1852936E-02	0.2210490E-03	0.1344922E+02	0.1000000E+02	0.1000000E+06
400	0.5005208E-04	0.2829783E-01	0.2319374E-02	0.2644447E-03	0.1838281E+02	0.1000000E+02	0.1000000E+06
500	0.5636536E-04	0.3109513E-01	0.2014757E-02	0.3433216E-03	0.4117969E+02	0.1000000E+02	0.1000000E+06
600	0.9325243E-04	0.6538557E-01	0.5868510E-02	0.4405038E-03	0.4775000E+02	0.1000000E+02	0.1000000E+06
700	0.9811118E-04	0.6685247E-01	0.6394971E-02	0.5001470E-03	0.7309766E+02	0.1000000E+02	0.1000000E+06
800	0.8894938E-04	0.5421164E-01	0.4907421E-02	0.5651821E-03	0.1026094E+03	0.1000000E+02	0.1000000E+06
900	0.1000319E-03	0.4134533E-01	0.4309068E-02	0.6218673E-03	0.1341094E+03	0.1000000E+02	0.1000000E+06
1000	0.7755651E-04	0.5580629E-01	0.5944753E-02	0.6708944E-03	0.1719023E+03	0.1000000E+02	0.1000000E+06

```
#  p=7n/10 j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
```

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.5498378E-04	0.4332914E-01	0.5105494E-03	0.7601275E-04	0.7500000E+00	0.1000000E+02	0.1000000E+06
200	0.2127671E-03	0.4702845E-01	0.2709956E-02	0.1450522E-03	0.7410156E+01	0.1000000E+02	0.1000000E+06
300	0.1014845E-03	0.5544462E-01	0.2704581E-02	0.1949579E-03	0.1020312E+02	0.1000000E+02	0.1000000E+06
400	0.6124652E-04	0.7694665E-01	0.1531312E-02	0.2809272E-03	0.2227734E+02	0.1000000E+02	0.1000000E+06
500	0.1098083E-03	0.7659132E-01	0.2200205E-02	0.3540329E-03	0.4992969E+02	0.1000000E+02	0.1000000E+06
600	0.8604503E-04	0.5398464E-01	0.2365849E-02	0.4399169E-03	0.4894141E+02	0.1000000E+02	0.1000000E+06
700	0.8683929E-04	0.4581119E-01	0.2937600E-02	0.4564007E-03	0.8496094E+02	0.1000000E+02	0.1000000E+06
800	0.9542465E-04	0.3263598E-01	0.1850529E-02	0.5608798E-03	0.1306797E+03	0.1000000E+02	0.1000000E+06
900	0.9566024E-04	0.7385649E-01	0.1828385E-02	0.6533533E-03	0.1602617E+03	0.1000000E+02	0.1000000E+06
1000	0.1143870E-03	0.6945690E-01	0.4575259E-02	0.7445465E-03	0.2006523E+03	0.1000000E+02	0.1000000E+06

```
#  p=7n/10 j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
```

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.1615476E-03	0.1180908E+00	0.3474855E-02	0.6638946E-04	0.7109375E+00	0.1000000E+02	0.1000000E+06
200	0.1444063E-03	0.9056647E-01	0.2949242E-02	0.1446752E-03	0.4480469E+01	0.1000000E+02	0.1000000E+06
300	0.1431099E-03	0.5176937E-01	0.2427663E-02	0.2178227E-03	0.1144922E+02	0.1000000E+02	0.1000000E+06
400	0.2004276E-03	0.7366756E-01	0.3743373E-02	0.2802401E-03	0.2190625E+02	0.1000000E+02	0.1000000E+06
500	0.1150684E-03	0.3875429E-01	0.3276767E-02	0.3328178E-03	0.3905078E+02	0.1000000E+02	0.1000000E+06
600	0.9305305E-04	0.6550771E-01	0.4755054E-02	0.4020398E-03	0.5967969E+02	0.1000000E+02	0.1000000E+06
700	0.9000283E-04	0.4680175E-01	0.2155770E-02	0.4723759E-03	0.8888281E+02	0.1000000E+02	0.1000000E+06
800	0.6706009E-04	0.2564211E-01	0.2669407E-02	0.5573153E-03	0.1220547E+03	0.1000000E+02	0.1000000E+06
900	0.1380408E-03	0.5637061E-01	0.4504763E-02	0.6354033E-03	0.1140391E+03	0.1000000E+02	0.1000000E+06
1000	0.1343231E-03	0.6596913E-01	0.2418520E-02	0.7263210E-03	0.1831953E+03	0.1000000E+02	0.1000000E+06

Next we list the table for the convex case, however a rankdeficient H

```
#run auf fb04373, -O3 -funroll-loops -fexpensive-optimizations
#bounds treated by projectionx0=(1,...,1)
#rank of equation has defect p* 0.100
#  p=n/10  j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
```

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.2285300E-05	0.3124020E+00	0.4386602E-06	0.7848470E-05	0.3999999E-01	0.1000000E+02	0.1000000E+06
200	0.1251952E-05	0.8046247E-01	0.3848219E-06	0.1977925E-04	0.2000000E+00	0.1000000E+02	0.1000000E+06
300	0.1340475E-05	0.1207114E+00	0.3187642E-06	0.2933708E-04	0.9499998E+00	0.1000000E+02	0.1000000E+06
400	0.2289474E-05	0.1329825E+00	0.1999836E-04	0.4042808E-04	0.7169998E+01	0.1000000E+02	0.1000000E+06
500	0.3300212E-05	0.1745996E+00	0.1889199E-04	0.4484960E-04	0.1087000E+02	0.1000000E+02	0.1000000E+06
600	0.4518070E-05	0.1809047E+00	0.2950460E-04	0.5500729E-04	0.1575000E+02	0.1000000E+02	0.1000000E+06
700	0.2102203E-05	0.8270302E-01	0.1638047E-04	0.6415163E-04	0.2277002E+02	0.1000000E+02	0.1000000E+06
800	0.1406182E-05	0.2209482E+00	0.5802318E-05	0.6925360E-04	0.3623999E+02	0.1000000E+02	0.1000000E+06
900	0.1559503E-05	0.1349740E+00	0.2686176E-04	0.7973034E-04	0.3638000E+02	0.1000000E+02	0.1000000E+06
1000	0.6814536E-05	0.1974383E+00	0.3051125E-04	0.9555623E-04	0.4635999E+02	0.1000000E+02	0.1000000E+06

```
#  p=n/10  j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
```

```
# n=        x_err          mu_err         l_err       infeasibility    time used     penalty_param   smoothing_param
  100 0.2072924E-04   0.7316326E-01   0.5821963E-05   0.1038569E-04   0.7006836E-01   0.1000000E+02   0.1000000E+06
  200 0.2247065E-05   0.1812935E+00   0.3915214E-06   0.1980003E-04   0.3900146E+00   0.1000000E+02   0.1000000E+06
  300 0.5179075E-05   0.2116702E+00   0.1201868E-05   0.2867846E-04   0.2949951E+01   0.1000000E+02   0.1000000E+06
  400 0.1619057E-03   0.2613755E+00   0.1899098E-03   0.3226965E-04   0.9209961E+01   0.1000000E+02   0.1000000E+06
  500 0.1493548E-03   0.1280459E+00   0.8862684E-03   0.4654985E-04   0.1401001E+02   0.1000000E+02   0.1000000E+06
  600 0.9836218E-04   0.2356804E+00   0.1755181E-03   0.4500134E-04   0.2006995E+02   0.1000000E+02   0.1000000E+06
  700 0.7652719E-04   0.2609227E+00   0.9204626E-04   0.5858539E-04   0.3051001E+02   0.1000000E+02   0.1000000E+06
  800 0.1344825E-03   0.1332374E+00   0.2082857E-03   0.8177448E-04   0.5527002E+02   0.1000000E+02   0.1000000E+06
  900 0.7113943E-04   0.1469498E+00   0.7560952E-04   0.9631645E-04   0.4970996E+02   0.1000000E+02   0.1000000E+06
 1000 0.1981230E-03   0.1038051E+00   0.5860541E-03   0.1013623E-03   0.6041016E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=        x_err          mu_err         l_err       infeasibility    time used     penalty_param   smoothing_param
  100 0.1994920E-04   0.1136916E+00   0.3981084E-05   0.9082831E-05   0.3979492E-01   0.1000000E+02   0.1000000E+06
  200 0.1091435E-04   0.2859408E+00   0.1931927E-05   0.1714723E-04   0.2800293E+00   0.1000000E+02   0.1000000E+06
  300 0.1803502E-04   0.2168792E+00   0.3356985E-05   0.2747382E-04   0.1540039E+01   0.1000000E+02   0.1000000E+06
  400 0.3601470E-04   0.2946892E-01   0.6108509E-04   0.4394162E-04   0.8219971E+01   0.1000000E+02   0.1000000E+06
  500 0.6508037E-04   0.2065743E+00   0.3032327E-03   0.4053458E-04   0.1317993E+02   0.1000000E+02   0.1000000E+06
  600 0.1040584E-04   0.1593763E+00   0.4038961E-04   0.6198992E-04   0.2517993E+02   0.1000000E+02   0.1000000E+06
  700 0.1619525E-03   0.1542925E+00   0.6327886E-03   0.7078270E-04   0.2968994E+02   0.1000000E+02   0.1000000E+06
  800 0.1584894E-03   0.1691193E+00   0.3270791E-03   0.7115381E-04   0.4044019E+02   0.1000000E+02   0.1000000E+06
  900 0.1699494E-03   0.1967633E+00   0.4720405E-03   0.8352258E-04   0.7306006E+02   0.1000000E+02   0.1000000E+06
 1000 0.2555794E-03   0.1926610E+00   0.1649668E-03   0.9597480E-04   0.6150000E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=        x_err          mu_err         l_err       infeasibility    time used     penalty_param   smoothing_param
  100 0.1403582E-04   0.2097082E+00   0.3080352E-05   0.8892420E-05   0.2001953E-01   0.1000000E+02   0.1000000E+06
  200 0.1038677E-04   0.2981190E+00   0.2063785E-05   0.1714910E-04   0.2797852E+00   0.1000000E+02   0.1000000E+06
  300 0.7548096E-04   0.3457259E+00   0.1097010E-04   0.2099866E-04   0.1729980E+01   0.1000000E+02   0.1000000E+06
  400 0.3073858E-05   0.1789916E+00   0.9928790E-05   0.4094965E-04   0.9709961E+01   0.1000000E+02   0.1000000E+06
  500 0.1308618E-03   0.2107472E+00   0.1074554E-03   0.5037231E-04   0.1287012E+02   0.1000000E+02   0.1000000E+06
  600 0.1472675E-03   0.1292887E+00   0.1895220E-03   0.6108900E-04   0.1983984E+02   0.1000000E+02   0.1000000E+06
  700 0.1145054E-03   0.2213544E+00   0.8568185E-04   0.6142177E-04   0.3593994E+02   0.1000000E+02   0.1000000E+06
  800 0.1711278E-03   0.1883629E+00   0.1189152E-03   0.7510878E-04   0.3255029E+02   0.1000000E+02   0.1000000E+06
  900 0.1097810E-03   0.2318540E+00   0.1440711E-03   0.7661300E-04   0.4000000E+02   0.1000000E+02   0.1000000E+06
 1000 0.2319503E-03   0.1088002E+00   0.2912694E-03   0.8522366E-04   0.8439990E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=        x_err          mu_err         l_err       infeasibility    time used     penalty_param   smoothing_param
  100 0.1612517E-05   0.2790173E+00   0.6382746E-06   0.6830442E-05   0.2001953E-01   0.1000000E+02   0.1000000E+06
  200 0.2281499E-05   0.1724568E+00   0.7528623E-06   0.1950809E-04   0.2202148E+00   0.1000000E+02   0.1000000E+06
  300 0.1422922E-05   0.1343405E+00   0.6010019E-06   0.3167202E-04   0.1129883E+01   0.1000000E+02   0.1000000E+06
  400 0.1866589E-05   0.1568268E+00   0.3506286E-04   0.4127575E-04   0.6979980E+01   0.1000000E+02   0.1000000E+06
  500 0.1786216E-05   0.1256808E+00   0.1353466E-04   0.4986183E-04   0.1382959E+02   0.1000000E+02   0.1000000E+06
  600 0.1624339E-05   0.1474913E+00   0.1551179E-05   0.6010988E-04   0.2106006E+02   0.1000000E+02   0.1000000E+06
  700 0.3613419E-05   0.1918333E+00   0.6350923E-04   0.6915087E-04   0.2317969E+02   0.1000000E+02   0.1000000E+06
  800 0.8727510E-05   0.1481757E+00   0.3463455E-04   0.7597268E-04   0.3529004E+02   0.1000000E+02   0.1000000E+06
  900 0.7358454E-05   0.1840394E+00   0.1152641E-03   0.8645459E-04   0.6024023E+02   0.1000000E+02   0.1000000E+06
 1000 0.1110186E-04   0.2381303E+00   0.2465134E-04   0.9270720E-04   0.6204980E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=        x_err          mu_err         l_err       infeasibility    time used     penalty_param   smoothing_param
  100 0.3638468E-04   0.2753879E+00   0.1344500E-04   0.8359802E-05   0.2978516E-01   0.1000000E+02   0.1000000E+06
  200 0.9949467E-05   0.1558395E+00   0.5195956E-05   0.1945245E-04   0.2700195E+00   0.1000000E+02   0.1000000E+06
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  300 0.1006666E-04   0.1558559E+00   0.3588234E-05   0.3195942E-04   0.1850098E+01   0.1000000E+02   0.1000000E+06
  400 0.5686457E-05   0.1142496E+00   0.1759630E-04   0.3539216E-04   0.1249023E+02   0.1000000E+02   0.1000000E+06
  500 0.4788930E-04   0.2498928E+00   0.1360540E-03   0.3870810E-04   0.1487012E+02   0.1000000E+02   0.1000000E+06
  600 0.3081056E-04   0.1879767E+00   0.8020813E-04   0.5330613E-04   0.3686963E+02   0.1000000E+02   0.1000000E+06
  700 0.8563871E-04   0.1625037E+00   0.3593415E-03   0.6930547E-04   0.4189990E+02   0.1000000E+02   0.1000000E+06
  800 0.3115196E-04   0.2499268E+00   0.7075098E-04   0.7557025E-04   0.5111035E+02   0.1000000E+02   0.1000000E+06
  900 0.6518984E-04   0.2844608E+00   0.1688121E-03   0.7231487E-04   0.5843018E+02   0.1000000E+02   0.1000000E+06
 1000 0.4888857E-04   0.2400918E+00   0.1074863E-03   0.8280579E-04   0.9250977E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.3958103E-04   0.2599110E+00   0.2279023E-04   0.9931576E-05   0.4003906E-01   0.1000000E+02   0.1000000E+06
  200 0.2263112E-04   0.2319086E+00   0.1048427E-04   0.1883446E-04   0.6894531E+00   0.1000000E+02   0.1000000E+06
  300 0.5630418E-05   0.1355693E+00   0.2371699E-05   0.3500495E-04   0.2209961E+01   0.1000000E+02   0.1000000E+06
  400 0.5118738E-04   0.2468351E+00   0.1036542E-03   0.3564860E-04   0.9290039E+01   0.1000000E+02   0.1000000E+06
  500 0.1312391E-03   0.1723187E+00   0.3263209E-03   0.4463114E-04   0.2009961E+02   0.1000000E+02   0.1000000E+06
  600 0.2661834E-04   0.2366382E+00   0.6765333E-04   0.4967992E-04   0.2399023E+02   0.1000000E+02   0.1000000E+06
  700 0.4760021E-04   0.1075187E+00   0.9799649E-04   0.6490822E-04   0.5024023E+02   0.1000000E+02   0.1000000E+06
  800 0.9291092E-04   0.2448386E+00   0.2538001E-03   0.7953033E-04   0.6269043E+02   0.1000000E+02   0.1000000E+06
  900 0.1067908E-03   0.2089425E+00   0.2600173E-03   0.8321210E-04   0.5409961E+02   0.1000000E+02   0.1000000E+06
 1000 0.1260549E-03   0.2062271E+00   0.2099251E-03   0.8827574E-04   0.1049795E+03   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.1693249E-05   0.2336710E+00   0.7400815E-06   0.1285953E-04   0.2929688E-01   0.1000000E+02   0.1000000E+06
  200 0.1735601E-04   0.1239503E+00   0.7788899E-05   0.1814074E-04   0.2500000E+00   0.1000000E+02   0.1000000E+06
  300 0.5016243E-05   0.1759440E+00   0.2316105E-05   0.2685702E-04   0.2089844E+01   0.1000000E+02   0.1000000E+06
  400 0.7686455E-05   0.3177662E+00   0.4244408E-04   0.3286897E-04   0.1250977E+02   0.1000000E+02   0.1000000E+06
  500 0.1770269E-04   0.1791165E+00   0.1462983E-03   0.4759939E-04   0.1529004E+02   0.1000000E+02   0.1000000E+06
  600 0.6492322E-04   0.2064389E+00   0.1690322E-03   0.5229003E-04   0.3108008E+02   0.1000000E+02   0.1000000E+06
  700 0.1277511E-03   0.1541008E+00   0.4144810E-03   0.6403403E-04   0.5042969E+02   0.1000000E+02   0.1000000E+06
  800 0.1206087E-03   0.1514212E+00   0.2019428E-03   0.7957732E-04   0.4310938E+02   0.1000000E+02   0.1000000E+06
  900 0.1197701E-03   0.2256442E+00   0.3319397E-03   0.9134235E-04   0.7328027E+02   0.1000000E+02   0.1000000E+06
 1000 0.5536270E-04   0.4214900E+00   0.1835922E-01   0.1146205E-03   0.7381934E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.2240840E-04   0.2576525E-01   0.3226401E-03   0.9790222E-05   0.4980469E-01   0.1000000E+02   0.1000000E+06
  200 0.7884683E-05   0.1805584E+00   0.1484783E-03   0.1662680E-04   0.2304688E+00   0.1000000E+02   0.1000000E+06
  300 0.5295054E-05   0.1461259E+00   0.3279383E-04   0.3444624E-04   0.1490234E+01   0.1000000E+02   0.1000000E+06
  400 0.9303956E-05   0.1917493E+00   0.1471800E-03   0.3570393E-04   0.9709961E+01   0.1000000E+02   0.1000000E+06
  500 0.7809843E-05   0.1508170E+00   0.8572374E-04   0.5105599E-04   0.1821973E+02   0.1000000E+02   0.1000000E+06
  600 0.8340570E-05   0.2587239E+00   0.1215094E-03   0.6070088E-04   0.3065039E+02   0.1000000E+02   0.1000000E+06
  700 0.7542617E-05   0.2085179E+00   0.8286845E-04   0.7042676E-04   0.3745996E+02   0.1000000E+02   0.1000000E+06
  800 0.1255422E-04   0.2314857E+00   0.2041401E-03   0.6720206E-04   0.5008008E+02   0.1000000E+02   0.1000000E+06
  900 0.1101185E-04   0.1909694E+00   0.1722899E-03   0.9287155E-04   0.6695020E+02   0.1000000E+02   0.1000000E+06
 1000 0.1229089E-04   0.1973562E+00   0.1608095E-03   0.8408461E-04   0.9645020E+02   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.4696930E-04   0.1175982E+00   0.3872957E-03   0.7823258E-05   0.5957031E-01   0.1000000E+02   0.1000000E+06
  200 0.3760430E-04   0.3029907E+00   0.5724357E-03   0.1619703E-04   0.6201172E+00   0.1000000E+02   0.1000000E+06
  300 0.3607632E-04   0.2051374E+00   0.2389841E-03   0.2804163E-04   0.4990234E+01   0.1000000E+02   0.1000000E+06
  400 0.2315434E-04   0.1483075E+00   0.1770979E-03   0.3362244E-04   0.1637012E+02   0.1000000E+02   0.1000000E+06
  500 0.1913884E-04   0.1223418E+00   0.2209636E-03   0.4790988E-04   0.3508984E+02   0.1000000E+02   0.1000000E+06
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  600 0.3590566E-04   0.1785741E+00   0.4021204E-03   0.6026544E-04   0.4225000E+02   0.1000000E+02   0.1000000E+06
  700 0.3548460E-04   0.1527850E+00   0.2119981E-03   0.6980524E-04   0.6813965E+02   0.1000000E+02   0.1000000E+06
  800 0.2535354E-04   0.1673707E+00   0.2895810E-03   0.7028410E-04   0.7920020E+02   0.1000000E+02   0.1000000E+06
  900 0.1345412E-04   0.1237982E+00   0.1494807E-03   0.8229021E-04   0.9766016E+02   0.1000000E+02   0.1000000E+06
 1000 0.3665980E-04   0.1593611E+00   0.5700881E-03   0.9416099E-04   0.1196797E+03   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err           l_err     infeasibility    time used     penalty_param   smoothing_param
  100 0.2909889E-04   0.4190107E+00   0.1683595E-03   0.6686462E-05   0.7031250E-01   0.1000000E+02   0.1000000E+06
  200 0.2452138E-04   0.2775626E+00   0.3652978E-03   0.1739328E-04   0.1009766E+01   0.1000000E+02   0.1000000E+06
  300 0.1432289E-04   0.1890236E+00   0.1077210E-03   0.2341987E-04   0.4360352E+01   0.1000000E+02   0.1000000E+06
  400 0.1306168E-04   0.2565013E+00   0.1566522E-03   0.3548541E-04   0.2351074E+02   0.1000000E+02   0.1000000E+06
  500 0.1323005E-04   0.3251671E+00   0.1073138E-03   0.3916741E-04   0.2844922E+02   0.1000000E+02   0.1000000E+06
  600 0.3579948E-04   0.2141931E+00   0.4570640E-03   0.6289319E-04   0.4708008E+02   0.1000000E+02   0.1000000E+06
  700 0.2974139E-04   0.1891421E+00   0.1680526E-03   0.7245383E-04   0.9354980E+02   0.1000000E+02   0.1000000E+06
  800 0.1842648E-04   0.1530015E+00   0.1699739E-03   0.7550354E-04   0.1028994E+03   0.1000000E+02   0.1000000E+06
  900 0.3411889E-04   0.2719763E+00   0.3331364E-03   0.7771161E-04   0.1059805E+03   0.1000000E+02   0.1000000E+06
 1000 0.3932426E-04   0.2022780E+00   0.3167087E-03   0.9973743E-04   0.1364307E+03   0.1000000E+02   0.1000000E+06


#  p=n/10  j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err           l_err     infeasibility    time used     penalty_param   smoothing_param
  100 0.6326926E-05   0.3204397E+00   0.6373486E-04   0.8756629E-05   0.5078125E-01   0.1000000E+02   0.1000000E+06
  200 0.5111293E-05   0.1716198E+00   0.2424521E-04   0.1581378E-04   0.6699219E+00   0.1000000E+02   0.1000000E+06
  300 0.9415106E-05   0.1700211E+00   0.1352903E-03   0.2743258E-04   0.3150391E+01   0.1000000E+02   0.1000000E+06
  400 0.1957099E-04   0.1332527E+00   0.2108024E-03   0.4054604E-04   0.1738086E+02   0.1000000E+02   0.1000000E+06
  500 0.3142609E-04   0.1792814E+00   0.2760502E-03   0.5194245E-04   0.3124023E+02   0.1000000E+02   0.1000000E+06
  600 0.2347801E-04   0.2354806E+00   0.2257336E-03   0.5936381E-04   0.7834961E+02   0.1000000E+02   0.1000000E+06
  700 0.1123836E-04   0.2010619E+00   0.9980710E-04   0.7322781E-04   0.5642969E+02   0.1000000E+02   0.1000000E+06
  800 0.1416817E-04   0.1707451E+00   0.1889749E-03   0.7862053E-04   0.8233984E+02   0.1000000E+02   0.1000000E+06
  900 0.2331434E-04   0.2165919E+00   0.2390879E-03   0.8482145E-04   0.1461992E+03   0.1000000E+02   0.1000000E+06
 1000 0.2410408E-04   0.1729870E+00   0.3324534E-03   0.8846844E-04   0.1707598E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err           l_err     infeasibility    time used     penalty_param   smoothing_param
  100 0.8070299E-05   0.1767332E+00   0.4709698E-04   0.4425702E-04   0.3496094E+00   0.1000000E+02   0.1000000E+06
  200 0.2351106E-04   0.1601797E+00   0.2312445E-03   0.9467620E-04   0.2050781E+01   0.1000000E+02   0.1000000E+06
  300 0.3457994E-04   0.1694191E+00   0.1525779E-03   0.1368409E-03   0.6419922E+01   0.1000000E+02   0.1000000E+06
  400 0.4510220E-04   0.2033694E+00   0.3388232E-03   0.1862801E-03   0.1216992E+02   0.1000000E+02   0.1000000E+06
  500 0.4502141E-04   0.2045224E+00   0.1815964E-03   0.2602846E-03   0.1926953E+02   0.1000000E+02   0.1000000E+06
  600 0.4275392E-04   0.2034501E+00   0.1479528E-03   0.2699956E-03   0.2832031E+02   0.1000000E+02   0.1000000E+06
  700 0.1873138E-04   0.1635437E+00   0.7308662E-04   0.3228303E-03   0.3968945E+02   0.1000000E+02   0.1000000E+06
  800 0.3539558E-04   0.1907711E+00   0.2271176E-03   0.3610711E-03   0.4913086E+02   0.1000000E+02   0.1000000E+06
  900 0.3740298E-04   0.2174127E+00   0.1481768E-03   0.4086836E-03   0.6050000E+02   0.1000000E+02   0.1000000E+06
 1000 0.3092329E-04   0.2127411E+00   0.1121934E-03   0.4635963E-03   0.7744141E+02   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err           l_err     infeasibility    time used     penalty_param   smoothing_param
  100 0.2895084E-03   0.2842923E+00   0.5645822E-03   0.4596932E-04   0.5996094E+00   0.1000000E+02   0.1000000E+06
  200 0.2384793E-03   0.1851196E+00   0.3974592E-03   0.9007695E-04   0.3021484E+01   0.1000000E+02   0.1000000E+06
  300 0.4352332E-03   0.2388071E+00   0.5643164E-03   0.1373059E-03   0.9550781E+01   0.1000000E+02   0.1000000E+06
  400 0.4254548E-03   0.1786346E+00   0.7585239E-03   0.1797372E-03   0.1702930E+02   0.1000000E+02   0.1000000E+06
  500 0.4570657E-03   0.1570473E+00   0.3946090E-03   0.2377308E-03   0.2608984E+02   0.1000000E+02   0.1000000E+06
  600 0.2609045E-03   0.2077009E+00   0.4528934E-03   0.2806036E-03   0.4775977E+02   0.1000000E+02   0.1000000E+06
  700 0.3509879E-03   0.2136659E+00   0.4620551E-03   0.3042812E-03   0.5527148E+02   0.1000000E+02   0.1000000E+06
  800 0.2436447E-03   0.2102978E+00   0.4109879E-03   0.3668691E-03   0.7071875E+02   0.1000000E+02   0.1000000E+06
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  900 0.4932939E-03   0.2070301E+00   0.3130786E-03   0.4118056E-03   0.9764844E+02   0.1000000E+02   0.1000000E+06
 1000 0.3396079E-03   0.1909207E+00   0.3308720E-03   0.4554597E-03   0.1171895E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err           l_err     infeasibility    time used     penalty_param   smoothing_param
  100 0.3113729E-03   0.1286811E+00   0.1175704E-02   0.4950145E-04   0.7089844E+00   0.1000000E+02   0.1000000E+06
  200 0.5236258E-03   0.1708242E+00   0.1729530E-02   0.8807681E-04   0.2281250E+01   0.1000000E+02   0.1000000E+06
  300 0.2535903E-03   0.2128639E+00   0.1467132E-02   0.1408201E-03   0.7390625E+01   0.1000000E+02   0.1000000E+06
  400 0.3958147E-03   0.1873096E+00   0.8780673E-03   0.1855720E-03   0.1897852E+02   0.1000000E+02   0.1000000E+06
  500 0.4082156E-03   0.1873536E+00   0.5889391E-03   0.2311052E-03   0.2712891E+02   0.1000000E+02   0.1000000E+06
  600 0.5415381E-03   0.1784222E+00   0.3852638E-03   0.2855707E-03   0.4733008E+02   0.1000000E+02   0.1000000E+06
  700 0.3934064E-03   0.2080141E+00   0.4647152E-03   0.3279133E-03   0.5640039E+02   0.1000000E+02   0.1000000E+06
  800 0.3709554E-03   0.2226396E+00   0.7262576E-03   0.3564995E-03   0.7091992E+02   0.1000000E+02   0.1000000E+06
  900 0.2255648E-03   0.2144426E+00   0.1387797E-02   0.4221334E-03   0.9957031E+02   0.1000000E+02   0.1000000E+06
 1000 0.4902885E-03   0.2336484E+00   0.1134203E-02   0.4637082E-03   0.1252402E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err           l_err     infeasibility    time used     penalty_param   smoothing_param
  100 0.1945008E-03   0.2872196E+00   0.1619484E-03   0.5191749E-04   0.4394531E+00   0.1000000E+02   0.1000000E+06
  200 0.5317252E-03   0.1971387E+00   0.9264587E-03   0.8692607E-04   0.4541016E+01   0.1000000E+02   0.1000000E+06
  300 0.7881673E-03   0.1851813E+00   0.2359842E-02   0.1548958E-03   0.1074023E+02   0.1000000E+02   0.1000000E+06
  400 0.2530977E-03   0.1943529E+00   0.7000309E-03   0.1735902E-03   0.1600977E+02   0.1000000E+02   0.1000000E+06
  500 0.3808076E-03   0.2370821E+00   0.6842279E-03   0.2437560E-03   0.3352930E+02   0.1000000E+02   0.1000000E+06
  600 0.4832769E-03   0.1600705E+00   0.1031725E-02   0.2815386E-03   0.5380078E+02   0.1000000E+02   0.1000000E+06
  700 0.4029268E-03   0.1989242E+00   0.1065809E-02   0.3229375E-03   0.6208008E+02   0.1000000E+02   0.1000000E+06
  800 0.5201164E-03   0.2275049E+00   0.7711707E-03   0.3739569E-03   0.9091016E+02   0.1000000E+02   0.1000000E+06
  900 0.2571677E-03   0.2104217E+00   0.7819582E-03   0.4099328E-03   0.1199102E+03   0.1000000E+02   0.1000000E+06
 1000 0.4231041E-03   0.1921101E+00   0.6752908E-03   0.4721326E-03   0.1209102E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err           l_err     infeasibility    time used     penalty_param   smoothing_param
  100 0.2206280E-04   0.1953087E+00   0.1853619E-03   0.5740898E-04   0.5703125E+00   0.1000000E+02   0.1000000E+06
  200 0.5277049E-04   0.1503674E+00   0.2766472E-03   0.9891212E-04   0.2228516E+01   0.1000000E+02   0.1000000E+06
  300 0.5190306E-04   0.2043662E+00   0.1802424E-03   0.1396662E-03   0.6439453E+01   0.1000000E+02   0.1000000E+06
  400 0.4936973E-04   0.2160020E+00   0.2026085E-03   0.1806691E-03   0.1228906E+02   0.1000000E+02   0.1000000E+06
  500 0.6558059E-04   0.1889564E+00   0.1932718E-03   0.2336852E-03   0.2366016E+02   0.1000000E+02   0.1000000E+06
  600 0.3593088E-04   0.1828215E+00   0.9894996E-04   0.2859077E-03   0.3077930E+02   0.1000000E+02   0.1000000E+06
  700 0.4510817E-04   0.1917597E+00   0.4337271E-03   0.3220544E-03   0.4041992E+02   0.1000000E+02   0.1000000E+06
  800 0.4352104E-04   0.2065729E+00   0.2035518E-03   0.3564395E-03   0.5208984E+02   0.1000000E+02   0.1000000E+06
  900 0.5842554E-04   0.2206323E+00   0.3009775E-03   0.3912035E-03   0.6750000E+02   0.1000000E+02   0.1000000E+06
 1000 0.3961127E-04   0.1899734E+00   0.1438978E-03   0.4773577E-03   0.8431055E+02   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err           l_err     infeasibility    time used     penalty_param   smoothing_param
  100 0.1306181E-03   0.1440492E+00   0.1601226E-03   0.5464907E-04   0.6601562E+00   0.1000000E+02   0.1000000E+06
  200 0.2505851E-03   0.2539755E+00   0.1134139E-02   0.8648870E-04   0.3939453E+01   0.1000000E+02   0.1000000E+06
  300 0.1394181E-03   0.1494610E+00   0.3919247E-03   0.1499734E-03   0.1057031E+02   0.1000000E+02   0.1000000E+06
  400 0.1627937E-03   0.2158670E+00   0.4314861E-03   0.1793912E-03   0.2148047E+02   0.1000000E+02   0.1000000E+06
  500 0.1822051E-03   0.1705271E+00   0.7223952E-03   0.2189006E-03   0.3032031E+02   0.1000000E+02   0.1000000E+06
  600 0.1968519E-03   0.2221603E+00   0.5006537E-03   0.2840336E-03   0.5227930E+02   0.1000000E+02   0.1000000E+06
  700 0.2097292E-03   0.2403332E+00   0.3901538E-03   0.3203785E-03   0.7589062E+02   0.1000000E+02   0.1000000E+06
  800 0.1649008E-03   0.2288183E+00   0.5770705E-03   0.3728213E-03   0.6895898E+02   0.1000000E+02   0.1000000E+06
  900 0.2216532E-03   0.1894898E+00   0.4832793E-03   0.3777107E-03   0.1139902E+03   0.1000000E+02   0.1000000E+06
 1000 0.2059684E-03   0.1981438E+00   0.7567454E-03   0.4730463E-03   0.1279414E+03   0.1000000E+02   0.1000000E+06
```

p=n/2 j0=(n-p)/2
del_min = sig_min = x_low = lambda_low = 0.1000000E-02

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.2555770E-03	0.2261374E+00	0.3314184E-03	0.4276755E-04	0.3789062E+00	0.1000000E+02	0.1000000E+06
200	0.2615770E-03	0.1406434E+00	0.3946008E-03	0.9778843E-04	0.4281250E+01	0.1000000E+02	0.1000000E+06
300	0.3328903E-03	0.1522869E+00	0.7136626E-03	0.1394355E-03	0.9652344E+01	0.1000000E+02	0.1000000E+06
400	0.2541354E-03	0.1931057E+00	0.1508096E-02	0.2022089E-03	0.2119141E+02	0.1000000E+02	0.1000000E+06
500	0.1746864E-03	0.2157178E+00	0.9830248E-03	0.2287661E-03	0.2485156E+02	0.1000000E+02	0.1000000E+06
600	0.3211335E-03	0.1470309E+00	0.1356160E-02	0.2991432E-03	0.3910156E+02	0.1000000E+02	0.1000000E+06
700	0.3515993E-03	0.1623793E+00	0.1568379E-02	0.3233054E-03	0.7157031E+02	0.1000000E+02	0.1000000E+06
800	0.2207312E-03	0.2221707E+00	0.1049814E-02	0.3671732E-03	0.1261992E+03	0.1000000E+02	0.1000000E+06
900	0.1947329E-03	0.1991027E+00	0.8898624E-03	0.4061995E-03	0.1029805E+03	0.1000000E+02	0.1000000E+06
1000	0.2550143E-03	0.2530903E+00	0.1084448E-02	0.4691853E-03	0.1466016E+03	0.1000000E+02	0.1000000E+06

p=n/2 j0=(n-p)/2
del_min = sig_min = x_low = lambda_low = 0.1000000E-03

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.1410192E-03	0.2097044E+00	0.3709618E-03	0.4713627E-04	0.4882812E+00	0.1000000E+02	0.1000000E+06
200	0.1586115E-03	0.1430242E+00	0.5546717E-03	0.9665443E-04	0.2699219E+01	0.1000000E+02	0.1000000E+06
300	0.1200505E-03	0.1866953E+00	0.3438964E-03	0.1251595E-03	0.7859375E+01	0.1000000E+02	0.1000000E+06
400	0.3349833E-03	0.1692393E+00	0.5671696E-03	0.2091593E-03	0.1796094E+02	0.1000000E+02	0.1000000E+06
500	0.1577351E-03	0.2320338E+00	0.5286779E-03	0.2370362E-03	0.3093750E+02	0.1000000E+02	0.1000000E+06
600	0.2293278E-03	0.2112738E+00	0.8901110E-03	0.2601799E-03	0.4504688E+02	0.1000000E+02	0.1000000E+06
700	0.2141438E-03	0.1665557E+00	0.7330015E-03	0.3494799E-03	0.7798047E+02	0.1000000E+02	0.1000000E+06
800	0.2151290E-03	0.1986160E+00	0.4227925E-03	0.3729412E-03	0.7892969E+02	0.1000000E+02	0.1000000E+06
900	0.2583351E-03	0.2108185E+00	0.1372260E-02	0.4022314E-03	0.1073672E+03	0.1000000E+02	0.1000000E+06
1000	0.2338363E-03	0.1769996E+00	0.9569238E-03	0.4979608E-03	0.1823203E+03	0.1000000E+02	0.1000000E+06

p=n/2 j0=n-p
del_min = sig_min = x_low = lambda_low = 0.1000000E+00

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.8834254E-05	0.1518032E+00	0.8746311E-04	0.4346345E-04	0.4296875E+00	0.1000000E+02	0.1000000E+06
200	0.2522153E-04	0.1630187E+00	0.1654524E-03	0.9195510E-04	0.2750000E+01	0.1000000E+02	0.1000000E+06
300	0.3777599E-04	0.1550222E+00	0.3762567E-03	0.1459115E-03	0.8851562E+01	0.1000000E+02	0.1000000E+06
400	0.3392132E-04	0.1485440E+00	0.3074773E-03	0.1884280E-03	0.1851953E+02	0.1000000E+02	0.1000000E+06
500	0.5177066E-04	0.1934309E+00	0.3661009E-03	0.2456553E-03	0.3063281E+02	0.1000000E+02	0.1000000E+06
600	0.7440673E-04	0.1581437E+00	0.4548957E-03	0.2917112E-03	0.4253906E+02	0.1000000E+02	0.1000000E+06
700	0.3806306E-04	0.1845141E+00	0.3256218E-03	0.3087541E-03	0.5398828E+02	0.1000000E+02	0.1000000E+06
800	0.3796889E-04	0.2287440E+00	0.3451419E-03	0.3553502E-03	0.7807031E+02	0.1000000E+02	0.1000000E+06
900	0.5072788E-04	0.1943995E+00	0.2949934E-03	0.4262875E-03	0.1146602E+03	0.1000000E+02	0.1000000E+06
1000	0.4662152E-04	0.1666408E+00	0.3579269E-03	0.4811751E-03	0.1451289E+03	0.1000000E+02	0.1000000E+06

p=n/2 j0=n-p
del_min = sig_min = x_low = lambda_low = 0.1000000E-01

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.7045833E-04	0.1298480E+00	0.4439548E-03	0.4734216E-04	0.8789062E+00	0.1000000E+02	0.1000000E+06
200	0.8393451E-04	0.2512547E+00	0.1568716E-02	0.9262722E-04	0.3789062E+01	0.1000000E+02	0.1000000E+06
300	0.7290155E-04	0.1936006E+00	0.1080807E-02	0.1339823E-03	0.1562109E+02	0.1000000E+02	0.1000000E+06
400	0.9025246E-04	0.2323805E+00	0.1168179E-02	0.1816985E-03	0.3390234E+02	0.1000000E+02	0.1000000E+06
500	0.6671964E-04	0.2240873E+00	0.1140661E-02	0.2063849E-03	0.4375000E+02	0.1000000E+02	0.1000000E+06
600	0.5767271E-04	0.1914273E+00	0.5675870E-03	0.2866599E-03	0.6325000E+02	0.1000000E+02	0.1000000E+06
700	0.7285704E-04	0.1783262E+00	0.1282184E-02	0.3322334E-03	0.7935156E+02	0.1000000E+02	0.1000000E+06
800	0.6499842E-04	0.1858410E+00	0.5958856E-03	0.3850112E-03	0.1474219E+03	0.1000000E+02	0.1000000E+06
900	0.6104406E-04	0.1643512E+00	0.1052896E-02	0.4118431E-03	0.1557578E+03	0.1000000E+02	0.1000000E+06
1000	0.8758338E-04	0.2084438E+00	0.2211840E-02	0.4640729E-03	0.1767305E+03	0.1000000E+02	0.1000000E+06

p=n/2 j0=n-p
del_min = sig_min = x_low = lambda_low = 0.1000000E-02

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.2001641E-03	0.1974146E+00	0.1049160E-02	0.4562030E-04	0.8984375E+00	0.1000000E+02	0.1000000E+06
200	0.3646814E-04	0.1405047E+00	0.9831308E-03	0.9854910E-04	0.3839844E+01	0.1000000E+02	0.1000000E+06
300	0.6005506E-04	0.1982610E+00	0.3418411E-03	0.1442513E-03	0.1464062E+02	0.1000000E+02	0.1000000E+06
400	0.1366968E-03	0.1774575E+00	0.1283139E-02	0.1892420E-03	0.3226953E+02	0.1000000E+02	0.1000000E+06
500	0.8926593E-04	0.1586093E+00	0.3211552E-02	0.2366854E-03	0.4072656E+02	0.1000000E+02	0.1000000E+06
600	0.8412793E-04	0.2011962E+00	0.3861781E-03	0.2658952E-03	0.9613281E+02	0.1000000E+02	0.1000000E+06
700	0.8208589E-04	0.1596630E+00	0.3966253E-03	0.3413725E-03	0.1083906E+03	0.1000000E+02	0.1000000E+06
800	0.5851745E-04	0.1681708E+00	0.4362260E-03	0.3688846E-03	0.1784805E+03	0.1000000E+02	0.1000000E+06
900	0.9854222E-04	0.2135382E+00	0.9746704E-03	0.4079826E-03	0.1654297E+03	0.1000000E+02	0.1000000E+06
1000	0.8146656E-04	0.2046849E+00	0.8041073E-03	0.4731497E-03	0.2337812E+03	0.1000000E+02	0.1000000E+06

p=n/2 j0=n-p
del_min = sig_min = x_low = lambda_low = 0.1000000E-03

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.6024615E-04	0.3322040E+00	0.2517093E-03	0.3731562E-04	0.7890625E+00	0.1000000E+02	0.1000000E+06
200	0.9950169E-04	0.1790168E+00	0.7601015E-03	0.1071105E-03	0.5492188E+01	0.1000000E+02	0.1000000E+06
300	0.9952641E-04	0.1628847E+00	0.8147068E-03	0.1569025E-03	0.1306250E+02	0.1000000E+02	0.1000000E+06
400	0.6466122E-04	0.1916527E+00	0.3050710E-03	0.1835027E-03	0.3346094E+02	0.1000000E+02	0.1000000E+06
500	0.7213302E-04	0.1751516E+00	0.4208202E-03	0.2306641E-03	0.5020312E+02	0.1000000E+02	0.1000000E+06
600	0.6064026E-04	0.2007580E+00	0.1014333E-02	0.2671910E-03	0.6325000E+02	0.1000000E+02	0.1000000E+06
700	0.1267766E-03	0.1838367E+00	0.1364025E-02	0.3407049E-03	0.1004609E+03	0.1000000E+02	0.1000000E+06
800	0.7878306E-04	0.1832473E+00	0.6766682E-03	0.3711255E-03	0.1400273E+03	0.1000000E+02	0.1000000E+06
900	0.9322068E-04	0.2051921E+00	0.1171650E-02	0.4309319E-03	0.1973906E+03	0.1000000E+02	0.1000000E+06
1000	0.1052573E-03	0.2171351E+00	0.2647563E-02	0.4753225E-03	0.1745469E+03	0.1000000E+02	0.1000000E+06

p=7n/10 j0=(n-p)/4
del_min = sig_min = x_low = lambda_low = 0.1000000E+00

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.2571262E-04	0.2527448E+00	0.1341063E-03	0.5615173E-04	0.4101562E+00	0.1000000E+02	0.1000000E+06
200	0.2958016E-04	0.2201806E+00	0.1614824E-03	0.1312800E-03	0.2921875E+01	0.1000000E+02	0.1000000E+06
300	0.4126447E-04	0.2015924E+00	0.1171964E-03	0.1902214E-03	0.7621094E+01	0.1000000E+02	0.1000000E+06
400	0.6234256E-04	0.1653975E+00	0.2861806E-03	0.2677248E-03	0.1466797E+02	0.1000000E+02	0.1000000E+06
500	0.4045554E-04	0.1972127E+00	0.1126432E-03	0.3253910E-03	0.2380859E+02	0.1000000E+02	0.1000000E+06
600	0.2642939E-04	0.1946906E+00	0.9560692E-04	0.3988216E-03	0.3457031E+02	0.1000000E+02	0.1000000E+06
700	0.3047850E-04	0.1940182E+00	0.1779041E-03	0.4477192E-03	0.4580078E+02	0.1000000E+02	0.1000000E+06
800	0.4412830E-04	0.1952711E+00	0.2713053E-03	0.5272185E-03	0.5897266E+02	0.1000000E+02	0.1000000E+06
900	0.2256550E-04	0.2033024E+00	0.1491941E-03	0.5804072E-03	0.7803906E+02	0.1000000E+02	0.1000000E+06
1000	0.4484474E-04	0.1913921E+00	0.1841729E-03	0.6483432E-03	0.9967969E+02	0.1000000E+02	0.1000000E+06

p=7n/10 j0=(n-p)/4
del_min = sig_min = x_low = lambda_low = 0.1000000E-01

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.1621847E-03	0.1959392E+00	0.3546863E-03	0.7576900E-04	0.7695312E+00	0.1000000E+02	0.1000000E+06
200	0.2592802E-03	0.1525827E+00	0.4864340E-03	0.1353273E-03	0.4347656E+01	0.1000000E+02	0.1000000E+06
300	0.4502547E-03	0.1880374E+00	0.3906925E-03	0.1884055E-03	0.1178906E+02	0.1000000E+02	0.1000000E+06
400	0.5660855E-03	0.1950204E+00	0.3352255E-03	0.2593623E-03	0.1889844E+02	0.1000000E+02	0.1000000E+06
500	0.3676154E-03	0.1880798E+00	0.5253308E-03	0.3280284E-03	0.3435938E+02	0.1000000E+02	0.1000000E+06
600	0.3963271E-03	0.2194705E+00	0.4530445E-03	0.3851787E-03	0.4864062E+02	0.1000000E+02	0.1000000E+06
700	0.3245784E-03	0.2078224E+00	0.2655127E-03	0.4428989E-03	0.6192969E+02	0.1000000E+02	0.1000000E+06
800	0.3333984E-03	0.1902355E+00	0.6357334E-03	0.5127412E-03	0.8796094E+02	0.1000000E+02	0.1000000E+06
900	0.5244111E-03	0.1782137E+00	0.3496656E-03	0.5878837E-03	0.1079883E+03	0.1000000E+02	0.1000000E+06
1000	0.5580719E-03	0.2369103E+00	0.4423390E-03	0.6430125E-03	0.1338867E+03	0.1000000E+02	0.1000000E+06

p=7n/10 j0=(n-p)/4
del_min = sig_min = x_low = lambda_low = 0.1000000E-02

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.8105296E-03	0.1307500E+00	0.4387072E-03	0.6132558E-04	0.4804688E+00	0.1000000E+02	0.1000000E+06
200	0.7174184E-03	0.2655283E+00	0.8428596E-03	0.1324426E-03	0.4710938E+01	0.1000000E+02	0.1000000E+06

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  300 0.1572319E-02   0.2430299E+00   0.2110250E-02   0.1933554E-03   0.1108984E+02   0.1000000E+02   0.1000000E+06
  400 0.5428546E-03   0.1349372E+00   0.5275295E-03   0.2742554E-03   0.2103125E+02   0.1000000E+02   0.1000000E+06
  500 0.7171240E-03   0.1858354E+00   0.1560715E-02   0.3329427E-03   0.3768750E+02   0.1000000E+02   0.1000000E+06
  600 0.6487074E-03   0.1810027E+00   0.3905738E-03   0.4023556E-03   0.4736719E+02   0.1000000E+02   0.1000000E+06
  700 0.5030314E-03   0.2206976E+00   0.1605523E-02   0.4695130E-03   0.5989062E+02   0.1000000E+02   0.1000000E+06
  800 0.1064493E-02   0.1869980E+00   0.8908633E-03   0.5173864E-03   0.7408984E+02   0.1000000E+02   0.1000000E+06
  900 0.6118208E-03   0.2282232E+00   0.2446539E-02   0.6087681E-03   0.1060898E+03   0.1000000E+02   0.1000000E+06
 1000 0.5856868E-03   0.2281241E+00   0.1895858E-02   0.6690056E-03   0.1743516E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err           l_err       infeasibility     time used      penalty_param    smoothing_param
  100 0.1968393E-03   0.1794080E+00   0.1623897E-03   0.5561265E-04   0.5312500E+00   0.1000000E+02   0.1000000E+06
  200 0.7877086E-03   0.2252432E+00   0.1034693E-02   0.1258836E-03   0.5199219E+01   0.1000000E+02   0.1000000E+06
  300 0.6398968E-03   0.1824832E+00   0.3941736E-03   0.1872280E-03   0.1313672E+02   0.1000000E+02   0.1000000E+06
  400 0.9270674E-03   0.2253294E+00   0.6629426E-03   0.2598925E-03   0.2189062E+02   0.1000000E+02   0.1000000E+06
  500 0.7928505E-03   0.1480987E+00   0.9691670E-03   0.3187868E-03   0.3314062E+02   0.1000000E+02   0.1000000E+06
  600 0.3341140E-03   0.1896809E+00   0.4614323E-03   0.3928985E-03   0.6475000E+02   0.1000000E+02   0.1000000E+06
  700 0.7744794E-03   0.1837915E+00   0.1564637E-02   0.4569442E-03   0.7464062E+02   0.1000000E+02   0.1000000E+06
  800 0.5394637E-03   0.1727335E+00   0.7870902E-03   0.5734288E-03   0.1221211E+03   0.1000000E+02   0.1000000E+06
  900 0.5400485E-03   0.1977670E+00   0.1132314E-02   0.5969708E-03   0.9155078E+02   0.1000000E+02   0.1000000E+06
 1000 0.4678696E-03   0.1770313E+00   0.6023881E-03   0.6748082E-03   0.1575234E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err           l_err       infeasibility     time used      penalty_param    smoothing_param
  100 0.8358239E-04   0.2039634E+00   0.2798344E-03   0.7130061E-04   0.4492188E+00   0.1000000E+02   0.1000000E+06
  200 0.5421633E-04   0.1576569E+00   0.4290738E-03   0.1280125E-03   0.2839844E+01   0.1000000E+02   0.1000000E+06
  300 0.6621013E-04   0.2196549E+00   0.2694937E-03   0.1941319E-03   0.8460938E+01   0.1000000E+02   0.1000000E+06
  400 0.4516303E-04   0.1846253E+00   0.1414623E-03   0.2576254E-03   0.1460938E+02   0.1000000E+02   0.1000000E+06
  500 0.5363654E-04   0.1654529E+00   0.2400500E-03   0.3405548E-03   0.2482812E+02   0.1000000E+02   0.1000000E+06
  600 0.4962887E-04   0.2041689E+00   0.2467884E-03   0.3998239E-03   0.3448828E+02   0.1000000E+02   0.1000000E+06
  700 0.7126867E-04   0.1875513E+00   0.4402628E-03   0.4492484E-03   0.4806250E+02   0.1000000E+02   0.1000000E+06
  800 0.6385038E-04   0.1910355E+00   0.2283315E-03   0.5439740E-03   0.6225000E+02   0.1000000E+02   0.1000000E+06
  900 0.5590983E-04   0.2070786E+00   0.1761467E-03   0.5756706E-03   0.8116016E+02   0.1000000E+02   0.1000000E+06
 1000 0.3401218E-04   0.1977962E+00   0.8509775E-04   0.6474782E-03   0.1083203E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err           l_err       infeasibility     time used      penalty_param    smoothing_param
  100 0.2572700E-03   0.1123857E+00   0.3178498E-03   0.6584864E-04   0.7226562E+00   0.1000000E+02   0.1000000E+06
  200 0.6596577E-04   0.1595445E+00   0.1337264E-03   0.1334486E-03   0.3980469E+01   0.1000000E+02   0.1000000E+06
  300 0.1800950E-03   0.2039998E+00   0.4567155E-03   0.1787097E-03   0.1455859E+02   0.1000000E+02   0.1000000E+06
  400 0.2401871E-03   0.1660850E+00   0.6226934E-03   0.2818556E-03   0.2255078E+02   0.1000000E+02   0.1000000E+06
  500 0.2876526E-03   0.1805344E+00   0.5256826E-03   0.3265215E-03   0.3150000E+02   0.1000000E+02   0.1000000E+06
  600 0.3635284E-03   0.1782094E+00   0.6960831E-03   0.4037030E-03   0.5339844E+02   0.1000000E+02   0.1000000E+06
  700 0.2153994E-03   0.1956604E+00   0.3237075E-03   0.4301892E-03   0.6559375E+02   0.1000000E+02   0.1000000E+06
  800 0.2745236E-03   0.1867097E+00   0.4105509E-03   0.5217177E-03   0.1174453E+03   0.1000000E+02   0.1000000E+06
  900 0.2719932E-03   0.1935518E+00   0.3738966E-03   0.5749217E-03   0.1291250E+03   0.1000000E+02   0.1000000E+06
 1000 0.2555029E-03   0.1904958E+00   0.8692689E-03   0.6441528E-03   0.1518359E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err           l_err       infeasibility     time used      penalty_param    smoothing_param
  100 0.2065690E-03   0.2645788E+00   0.5387931E-03   0.5541532E-04   0.8437500E+00   0.1000000E+02   0.1000000E+06
  200 0.2730888E-03   0.1994253E+00   0.1053215E-02   0.1269117E-03   0.5078125E+01   0.1000000E+02   0.1000000E+06
  300 0.3775868E-03   0.1831344E+00   0.6701394E-03   0.1878786E-03   0.1021875E+02   0.1000000E+02   0.1000000E+06
  400 0.2657515E-03   0.2091001E+00   0.1262098E-02   0.2514198E-03   0.2471094E+02   0.1000000E+02   0.1000000E+06
  500 0.3008872E-03   0.1745420E+00   0.1722077E-02   0.3305982E-03   0.4465625E+02   0.1000000E+02   0.1000000E+06
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  600 0.3217245E-03   0.1734963E+00   0.2192578E-02   0.3928667E-03   0.5260938E+02   0.1000000E+02   0.1000000E+06
  700 0.3871741E-03   0.1865437E+00   0.8324765E-03   0.4614394E-03   0.6821094E+02   0.1000000E+02   0.1000000E+06
  800 0.2181194E-03   0.1704237E+00   0.8755089E-03   0.5210082E-03   0.1303359E+03   0.1000000E+02   0.1000000E+06
  900 0.2715696E-03   0.1912497E+00   0.1640232E-02   0.5763136E-03   0.1197891E+03   0.1000000E+02   0.1000000E+06
 1000 0.2478234E-03   0.2090610E+00   0.1451636E-02   0.6451340E-03   0.1628750E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.3248019E-03   0.2649575E+00   0.9965067E-03   0.6317816E-04   0.9062500E+00   0.1000000E+02   0.1000000E+06
  200 0.3134052E-03   0.2012833E+00   0.5400323E-03   0.1353216E-03   0.5000000E+01   0.1000000E+02   0.1000000E+06
  300 0.5841306E-03   0.1799564E+00   0.1408460E-02   0.1938267E-03   0.1461719E+02   0.1000000E+02   0.1000000E+06
  400 0.3649254E-03   0.1898866E+00   0.5062397E-03   0.2553037E-03   0.2133594E+02   0.1000000E+02   0.1000000E+06
  500 0.2592766E-03   0.1928549E+00   0.1128776E-02   0.3316005E-03   0.3514844E+02   0.1000000E+02   0.1000000E+06
  600 0.1883127E-03   0.1866899E+00   0.5817429E-03   0.3833271E-03   0.5468750E+02   0.1000000E+02   0.1000000E+06
  700 0.3721743E-03   0.2003043E+00   0.1741366E-02   0.4665663E-03   0.7513281E+02   0.1000000E+02   0.1000000E+06
  800 0.2329998E-03   0.2117790E+00   0.1353092E-02   0.5299878E-03   0.1085859E+03   0.1000000E+02   0.1000000E+06
  900 0.3500646E-03   0.2386219E+00   0.9737033E-03   0.5622322E-03   0.1914688E+03   0.1000000E+02   0.1000000E+06
 1000 0.3211703E-03   0.1812244E+00   0.1526630E-02   0.6640078E-03   0.1755547E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.3739527E-04   0.2164615E+00   0.1806652E-03   0.5844258E-04   0.5156250E+00   0.1000000E+02   0.1000000E+06
  200 0.8573119E-04   0.1511220E+00   0.7330815E-03   0.1360346E-03   0.3335938E+01   0.1000000E+02   0.1000000E+06
  300 0.5710562E-04   0.2175406E+00   0.6003984E-03   0.1971599E-03   0.1044531E+02   0.1000000E+02   0.1000000E+06
  400 0.7293578E-04   0.2130693E+00   0.3098761E-03   0.2592086E-03   0.1793750E+02   0.1000000E+02   0.1000000E+06
  500 0.6129748E-04   0.2061737E+00   0.4966318E-03   0.3214699E-03   0.3111719E+02   0.1000000E+02   0.1000000E+06
  600 0.5557775E-04   0.1688056E+00   0.2389896E-03   0.3836597E-03   0.4367188E+02   0.1000000E+02   0.1000000E+06
  700 0.6686257E-04   0.1880512E+00   0.4810921E-03   0.4746074E-03   0.6642969E+02   0.1000000E+02   0.1000000E+06
  800 0.6298005E-04   0.1805502E+00   0.4600045E-03   0.5272125E-03   0.8586719E+02   0.1000000E+02   0.1000000E+06
  900 0.5656313E-04   0.2059336E+00   0.4514616E-03   0.5736242E-03   0.9613281E+02   0.1000000E+02   0.1000000E+06
 1000 0.6183842E-04   0.2112457E+00   0.5098011E-03   0.6662885E-03   0.1440625E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.1988583E-03   0.1475708E+00   0.1064695E-02   0.6783284E-04   0.7265625E+00   0.1000000E+02   0.1000000E+06
  200 0.1293985E-03   0.2133318E+00   0.1158036E-02   0.1356854E-03   0.5929688E+01   0.1000000E+02   0.1000000E+06
  300 0.9251414E-04   0.1833248E+00   0.9453849E-03   0.1990503E-03   0.1532031E+02   0.1000000E+02   0.1000000E+06
  400 0.1780787E-03   0.2183936E+00   0.3162799E-02   0.2696736E-03   0.3536719E+02   0.1000000E+02   0.1000000E+06
  500 0.1081213E-03   0.2071754E+00   0.7474476E-03   0.3325178E-03   0.4810156E+02   0.1000000E+02   0.1000000E+06
  600 0.1653550E-03   0.2320243E+00   0.1535990E-02   0.3752676E-03   0.8779688E+02   0.1000000E+02   0.1000000E+06
  700 0.1089685E-03   0.2081258E+00   0.9811977E-03   0.4290391E-03   0.8933594E+02   0.1000000E+02   0.1000000E+06
  800 0.1010686E-03   0.2060373E+00   0.1598603E-02   0.5360046E-03   0.1154375E+03   0.1000000E+02   0.1000000E+06
  900 0.1157426E-03   0.1847358E+00   0.9058632E-03   0.5678468E-03   0.1568203E+03   0.1000000E+02   0.1000000E+06
 1000 0.1233072E-03   0.1801404E+00   0.1176253E-02   0.6454064E-03   0.2155938E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.1251945E-03   0.1387282E+00   0.4052917E-03   0.5973629E-04   0.7265625E+00   0.1000000E+02   0.1000000E+06
  200 0.1088255E-03   0.1445985E+00   0.6188085E-03   0.1359844E-03   0.3578125E+01   0.1000000E+02   0.1000000E+06
  300 0.1160138E-03   0.1850423E+00   0.9505587E-03   0.2044954E-03   0.1556250E+02   0.1000000E+02   0.1000000E+06
  400 0.1795289E-03   0.1410900E+00   0.2873158E-02   0.2631994E-03   0.2578906E+02   0.1000000E+02   0.1000000E+06
  500 0.1004904E-03   0.1731900E+00   0.8021518E-03   0.3174825E-03   0.4397656E+02   0.1000000E+02   0.1000000E+06
  600 0.1581134E-03   0.2028577E+00   0.2123755E-02   0.4076204E-03   0.7101562E+02   0.1000000E+02   0.1000000E+06
  700 0.1248609E-03   0.1764454E+00   0.1934434E-02   0.4738931E-03   0.9959375E+02   0.1000000E+02   0.1000000E+06
  800 0.1318295E-03   0.2069472E+00   0.1428022E-02   0.4928628E-03   0.1189297E+03   0.1000000E+02   0.1000000E+06
```

```
  900 0.1223024E-03   0.2165500E+00   0.6992229E-03   0.5800291E-03   0.1823516E+03   0.1000000E+02   0.1000000E+06
 1000 0.1265696E-03   0.2022096E+00   0.1008539E-02   0.6467454E-03   0.2361484E+03   0.1000000E+02   0.1000000E+06
```

```
#  p=7n/10 j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=        x_err           mu_err           l_err      infeasibility     time used     penalty_param   smoothing_param
  100 0.1881450E-03   0.2592706E+00   0.8129250E-03   0.5474375E-04   0.6093750E+00   0.1000000E+02   0.1000000E+06
  200 0.1525143E-03   0.2083339E+00   0.9956386E-03   0.1261206E-03   0.5890625E+01   0.1000000E+02   0.1000000E+06
  300 0.1762115E-03   0.1966554E+00   0.1765015E-02   0.1888306E-03   0.1417969E+02   0.1000000E+02   0.1000000E+06
  400 0.1275331E-03   0.2305831E+00   0.9730618E-03   0.2525485E-03   0.3349219E+02   0.1000000E+02   0.1000000E+06
  500 0.1416895E-03   0.1911186E+00   0.4479642E-03   0.3290755E-03   0.5175781E+02   0.1000000E+02   0.1000000E+06
  600 0.1072566E-03   0.2006878E+00   0.1161727E-02   0.3862577E-03   0.6125781E+02   0.1000000E+02   0.1000000E+06
  700 0.1387968E-03   0.1927002E+00   0.1275051E-02   0.4457732E-03   0.8982031E+02   0.1000000E+02   0.1000000E+06
  800 0.1038953E-03   0.2119838E+00   0.4434727E-03   0.4982468E-03   0.1286250E+03   0.1000000E+02   0.1000000E+06
  900 0.1265756E-03   0.1997660E+00   0.5949966E-03   0.5844815E-03   0.1565547E+03   0.1000000E+02   0.1000000E+06
 1000 0.1971318E-03   0.1893462E+00   0.1551604E-02   0.6674516E-03   0.1707422E+03   0.1000000E+02   0.1000000E+06
```

And finally the table for the test with H of full rank but A not positive semidefinite.

```
#  p=n/10  j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=        x_err           mu_err          l_err      infeasibility     time used    penalty_param   smoothing_param
  100 0.2390040E-05   0.1071953E-04   0.5171877E-06   0.9944649E-05   0.5000001E-01   0.1000000E+02   0.1000000E+06
  200 0.1305183E-05   0.4698500E-05   0.4020210E-06   0.1998696E-04   0.3400002E+00   0.1000000E+02   0.1000000E+06
  300 0.1408951E-05   0.4269848E-05   0.3145892E-06   0.3015031E-04   0.1669998E+01   0.1000000E+02   0.1000000E+06
  400 0.2484964E-05   0.3871255E-03   0.3177822E-04   0.4175774E-04   0.7149998E+01   0.1000000E+02   0.1000000E+06
  500 0.4783851E-05   0.1596211E-03   0.1224324E-04   0.4772765E-04   0.1170000E+02   0.1000000E+02   0.1000000E+06
  600 0.5221439E-05   0.4498772E-03   0.5385324E-04   0.5766849E-04   0.1621001E+02   0.1000000E+02   0.1000000E+06
  700 0.5547043E-05   0.5356090E-03   0.5556107E-04   0.6549147E-04   0.2204001E+02   0.1000000E+02   0.1000000E+06
  800 0.1788794E-05   0.5746321E-04   0.6080797E-05   0.7781470E-04   0.3696002E+02   0.1000000E+02   0.1000000E+06
  900 0.1797220E-05   0.1420828E-03   0.1498397E-04   0.8311196E-04   0.3885999E+02   0.1000000E+02   0.1000000E+06
 1000 0.1098568E-04   0.6464561E-03   0.5659681E-04   0.1073738E-03   0.5394006E+02   0.1000000E+02   0.1000000E+06
```

```
#  p=n/10  j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=        x_err           mu_err          l_err      infeasibility     time used    penalty_param   smoothing_param
  100 0.2111363E-04   0.9039637E-03   0.5942432E-05   0.1087062E-04   0.1500244E+00   0.1000000E+02   0.1000000E+06
  200 0.2396104E-05   0.1079696E-04   0.5460172E-06   0.2079607E-04   0.5999756E+00   0.1000000E+02   0.1000000E+06
  300 0.1473454E-04   0.1880797E-02   0.6348004E-05   0.3025426E-04   0.4359985E+01   0.1000000E+02   0.1000000E+06
  400 0.1503903E-03   0.6727053E-02   0.4214865E-03   0.4449082E-04   0.6089966E+01   0.1000000E+02   0.1000000E+06
  500 0.1182652E-03   0.2829897E-02   0.1069528E-03   0.5614386E-04   0.1165991E+02   0.1000000E+02   0.1000000E+06
  600 0.1214384E-03   0.3504264E-02   0.2518461E-03   0.6084832E-04   0.2454993E+02   0.1000000E+02   0.1000000E+06
  700 0.1397126E-03   0.3388229E-02   0.1627403E-03   0.8034294E-04   0.2213989E+02   0.1000000E+02   0.1000000E+06
  800 0.1630055E-03   0.3469289E-02   0.1825504E-03   0.8505834E-04   0.5609009E+02   0.1000000E+02   0.1000000E+06
  900 0.1212726E-03   0.4056152E-02   0.2894856E-03   0.9035931E-04   0.6172021E+02   0.1000000E+02   0.1000000E+06
 1000 0.1329374E-03   0.3940395E-02   0.3023848E-03   0.1011604E-03   0.7028003E+02   0.1000000E+02   0.1000000E+06
```

```
#  p=n/10  j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=        x_err           mu_err          l_err      infeasibility     time used    penalty_param   smoothing_param
  100 0.1284705E-03   0.2746687E-01   0.2307402E-04   0.6034643E-05   0.6005859E-01   0.1000000E+02   0.1000000E+06
  200 0.1766127E-03   0.4755854E-01   0.3247456E-04   0.2034294E-04   0.3698730E+00   0.1000000E+02   0.1000000E+06
  300 0.1282669E-03   0.2809027E-01   0.2189240E-04   0.3018818E-04   0.4699951E+01   0.1000000E+02   0.1000000E+06
  400 0.1457095E-03   0.4296294E-01   0.1739240E-03   0.3958612E-04   0.2153003E+02   0.1000000E+02   0.1000000E+06
  500 0.1168331E-03   0.2775727E-01   0.7463816E-04   0.4479723E-04   0.1525000E+02   0.1000000E+02   0.1000000E+06
  600 0.1509016E-03   0.7628954E-01   0.1915223E-03   0.5824094E-04   0.4534033E+02   0.1000000E+02   0.1000000E+06
  700 0.1244070E-03   0.6475970E-01   0.7746839E-03   0.7722649E-04   0.5919971E+02   0.1000000E+02   0.1000000E+06
  800 0.7071739E-04   0.4175404E-01   0.7248714E-04   0.7712984E-04   0.4087988E+02   0.1000000E+02   0.1000000E+06
  900 0.3272559E-03   0.1498123E+00   0.7291953E-03   0.1072235E-03   0.5870703E+03   0.1000000E+02   0.1000000E+06
 1000 0.1477241E-03   0.6738302E-01   0.4396625E-03   0.1041118E-03   0.2472700E+03   0.1000000E+02   0.1000000E+06
```

p=n/10 j0=(n-p)/4
del_min = sig_min = x_low = lambda_low = 0.1000000E-03

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.8704749E-04	0.1373793E+00	0.1220183E-04	0.8818593E-05	0.8007812E-01	0.1000000E+02	0.1000000E+06
200	0.5857263E-04	0.1287422E+00	0.1052677E-04	0.2050490E-04	0.6098633E+00	0.1000000E+02	0.1000000E+06
300	0.1598418E-03	0.1846141E+00	0.2611728E-04	0.2694060E-04	0.2000000E+01	0.1000000E+02	0.1000000E+06
400	0.1972852E-03	0.1603629E+00	0.3741520E-03	0.3526127E-04	0.6120117E+01	0.1000000E+02	0.1000000E+06
500	0.1274689E-03	0.6903657E-01	0.1050024E-03	0.4536619E-04	0.1241992E+02	0.1000000E+02	0.1000000E+06
600	0.3750178E-04	0.8990290E-01	0.8398312E-04	0.5954512E-04	0.1818994E+02	0.1000000E+02	0.1000000E+06
700	0.2319614E-03	0.4298912E-01	0.2914525E-03	0.6998965E-04	0.1112202E+03	0.1000000E+02	0.1000000E+06
800	0.1154441E-03	0.1372139E-01	0.8426133E-04	0.8027825E-04	0.3854980E+02	0.1000000E+02	0.1000000E+06
900	0.1660237E-03	0.6121997E-01	0.1652150E-03	0.8780276E-04	0.4828027E+02	0.1000000E+02	0.1000000E+06
1000	0.1360079E-03	0.2689887E-01	0.1004181E-03	0.1069523E-03	0.6199023E+02	0.1000000E+02	0.1000000E+06

p=n/10 j0=(n-p)/2
del_min = sig_min = x_low = lambda_low = 0.1000000E+00

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.2813985E-05	0.2290402E-04	0.1486618E-05	0.7583214E-05	0.8007812E-01	0.1000000E+02	0.1000000E+06
200	0.1545963E-05	0.1213067E-04	0.7308129E-06	0.2110408E-04	0.3798828E+00	0.1000000E+02	0.1000000E+06
300	0.2618693E-05	0.2931096E-04	0.1727164E-05	0.3262611E-04	0.1830078E+01	0.1000000E+02	0.1000000E+06
400	0.2716205E-05	0.1410997E-03	0.1136302E-04	0.4088816E-04	0.7139648E+01	0.1000000E+02	0.1000000E+06
500	0.5093696E-05	0.5913223E-03	0.5840609E-04	0.4956156E-04	0.1159961E+02	0.1000000E+02	0.1000000E+06
600	0.3791108E-05	0.1747569E-03	0.1973506E-04	0.6611649E-04	0.2045996E+02	0.1000000E+02	0.1000000E+06
700	0.4232906E-05	0.2719926E-03	0.3572262E-04	0.6122058E-04	0.2361914E+02	0.1000000E+02	0.1000000E+06
800	0.2389218E-05	0.3669723E-04	0.3889442E-05	0.8370466E-04	0.2572949E+02	0.1000000E+02	0.1000000E+06
900	0.4811890E-05	0.4869795E-03	0.6214997E-04	0.1012652E-03	0.5518066E+02	0.1000000E+02	0.1000000E+06
1000	0.4603458E-05	0.1834524E-03	0.1720933E-04	0.9073565E-04	0.7303027E+02	0.1000000E+02	0.1000000E+06

p=n/10 j0=(n-p)/2
del_min = sig_min = x_low = lambda_low = 0.1000000E-01

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.1363046E-04	0.8595527E-03	0.4983361E-05	0.6792462E-05	0.9960938E-01	0.1000000E+02	0.1000000E+06
200	0.2405844E-04	0.2138841E-02	0.1159954E-04	0.1802256E-04	0.1519531E+01	0.1000000E+02	0.1000000E+06
300	0.1786923E-04	0.2509668E-02	0.1648574E-04	0.2916366E-04	0.2669922E+01	0.1000000E+02	0.1000000E+06
400	0.4415848E-04	0.2857807E-02	0.2972990E-03	0.3722446E-04	0.6849609E+01	0.1000000E+02	0.1000000E+06
500	0.2961909E-04	0.2670376E-02	0.2714679E-03	0.4940404E-04	0.1302930E+02	0.1000000E+02	0.1000000E+06
600	0.6602017E-04	0.1934002E-02	0.1145489E-03	0.6363594E-04	0.4013965E+02	0.1000000E+02	0.1000000E+06
700	0.8361010E-04	0.3861422E-02	0.3512916E-03	0.6904393E-04	0.3813965E+02	0.1000000E+02	0.1000000E+06
800	0.3708695E-04	0.1863655E-02	0.1188815E-03	0.8014892E-04	0.4576953E+02	0.1000000E+02	0.1000000E+06
900	0.8249228E-04	0.3727817E-02	0.2007072E-03	0.9853764E-04	0.8966992E+02	0.1000000E+02	0.1000000E+06
1000	0.6285414E-04	0.3774982E-02	0.3150718E-03	0.1018863E-03	0.1193799E+03	0.1000000E+02	0.1000000E+06

p=n/10 j0=(n-p)/2
del_min = sig_min = x_low = lambda_low = 0.1000000E-02

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.9470089E-04	0.1076599E+00	0.5204077E-04	0.9540669E-05	0.6933594E-01	0.1000000E+02	0.1000000E+06
200	0.4165466E-04	0.4651870E-01	0.2264543E-04	0.2073096E-04	0.1070312E+01	0.1000000E+02	0.1000000E+06
300	0.2596109E-04	0.8301192E-02	0.1105909E-04	0.3431758E-04	0.3410156E+01	0.1000000E+02	0.1000000E+06
400	0.2790779E-04	0.1577061E-01	0.1519887E-04	0.3655354E-04	0.8170898E+01	0.1000000E+02	0.1000000E+06
500	0.4383608E-04	0.1672600E-01	0.4480751E-04	0.4706870E-04	0.1216992E+02	0.1000000E+02	0.1000000E+06
600	0.1600515E-03	0.1103171E-01	0.2707256E-03	0.6125168E-04	0.6055957E+02	0.1000000E+02	0.1000000E+06
700	0.8251721E-04	0.2218580E-01	0.2539888E-03	0.7035502E-04	0.5353906E+02	0.1000000E+02	0.1000000E+06
800	0.1339433E-03	0.2694870E-01	0.1988980E-03	0.8967870E-04	0.7142969E+02	0.1000000E+02	0.1000000E+06
900	0.5603393E-04	0.3038289E-01	0.2528490E-03	0.8197041E-04	0.1114805E+03	0.1000000E+02	0.1000000E+06
1000	0.1310446E-03	0.1315013E-01	0.3588457E-03	0.1038546E-03	0.1108301E+03	0.1000000E+02	0.1000000E+06

p=n/10 j0=(n-p)/2
del_min = sig_min = x_low = lambda_low = 0.1000000E-03

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.4679164E-04	0.2080655E+00	0.1329346E-04	0.1152159E-04	0.9082031E-01	0.1000000E+02	0.1000000E+06
200	0.1401578E-04	0.1391310E+00	0.6925792E-05	0.1739069E-04	0.6201172E+00	0.1000000E+02	0.1000000E+06
300	0.6895104E-05	0.1100569E-01	0.3233385E-05	0.3171752E-04	0.3959961E+01	0.1000000E+02	0.1000000E+06
400	0.3086268E-04	0.1369759E+00	0.1765090E-04	0.3710136E-04	0.6290039E+01	0.1000000E+02	0.1000000E+06
500	0.2024741E-04	0.5183552E-01	0.9893270E-04	0.4658440E-04	0.2328027E+02	0.1000000E+02	0.1000000E+06
600	0.8192089E-04	0.4842894E-01	0.2570865E-03	0.5261706E-04	0.3102051E+02	0.1000000E+02	0.1000000E+06
700	0.5110484E-04	0.8512944E-02	0.1234482E-03	0.7115609E-04	0.2212012E+02	0.1000000E+02	0.1000000E+06
800	0.6118973E-04	0.1549133E-01	0.1314207E-03	0.8474424E-04	0.8520996E+02	0.1000000E+02	0.1000000E+06
900	0.3615909E-04	0.3849820E-01	0.8629117E-04	0.9109691E-04	0.6519922E+02	0.1000000E+02	0.1000000E+06
1000	0.4309079E-04	0.7760236E-01	0.1066676E-03	0.9349717E-04	0.6751953E+02	0.1000000E+02	0.1000000E+06

p=n/10 j0=n-p
del_min = sig_min = x_low = lambda_low = 0.1000000E+00

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.5872284E-05	0.3485540E-03	0.2286901E-04	0.9833723E-05	0.9179688E-01	0.1000000E+02	0.1000000E+06
200	0.2402545E-04	0.9226118E-02	0.4910412E-03	0.1992688E-04	0.6093750E+00	0.1000000E+02	0.1000000E+06
300	0.2446284E-04	0.1179326E-01	0.8119738E-03	0.3195433E-04	0.2580078E+01	0.1000000E+02	0.1000000E+06
400	0.1901671E-04	0.1127177E-01	0.8353902E-03	0.3605909E-04	0.1038867E+02	0.1000000E+02	0.1000000E+06
500	0.5490838E-04	0.7303723E-01	0.9171009E-02	0.4716499E-04	0.2150000E+02	0.1000000E+02	0.1000000E+06
600	0.2417372E-04	0.1444526E+00	0.1230475E-01	0.6005460E-04	0.2394141E+02	0.1000000E+02	0.1000000E+06
700	0.3574018E-04	0.2810579E-01	0.2731283E-02	0.6809354E-04	0.8808984E+02	0.1000000E+02	0.1000000E+06
800	0.1308304E-04	0.4633406E-01	0.4150333E-02	0.7309185E-04	0.4922070E+02	0.1000000E+02	0.1000000E+06
900	0.3140162E-04	0.5027405E-01	0.3647363E-02	0.8220906E-04	0.8294141E+02	0.1000000E+02	0.1000000E+06
1000	0.1800155E-04	0.1145442E-01	0.1427556E-02	0.9660666E-04	0.8316992E+02	0.1000000E+02	0.1000000E+06

p=n/10 j0=n-p
del_min = sig_min = x_low = lambda_low = 0.1000000E-01

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.4740863E-04	0.1464436E+00	0.1555935E-02	0.5443209E-05	0.1503906E+00	0.1000000E+02	0.1000000E+06
200	0.4088979E-04	0.1177749E+00	0.1332539E-02	0.1466879E-04	0.6601562E+00	0.1000000E+02	0.1000000E+06
300	0.3198653E-04	0.9151435E-01	0.2712164E-02	0.2884262E-04	0.6529297E+01	0.1000000E+02	0.1000000E+06
400	0.5192298E-04	0.8540964E-01	0.2229707E-02	0.3492793E-04	0.1972070E+02	0.1000000E+02	0.1000000E+06
500	0.2167627E-04	0.4668331E-01	0.8724828E-03	0.4490974E-04	0.3058008E+02	0.1000000E+02	0.1000000E+06
600	0.3455365E-04	0.1045193E+00	0.2348969E-02	0.4838487E-04	0.3064062E+02	0.1000000E+02	0.1000000E+06
700	0.4573125E-04	0.1198462E+00	0.3421577E-02	0.6259314E-04	0.5870898E+02	0.1000000E+02	0.1000000E+06
800	0.4161799E-04	0.6556851E-01	0.1775213E-02	0.8186061E-04	0.8438086E+02	0.1000000E+02	0.1000000E+06
900	0.3342729E-04	0.1050426E+00	0.1981936E-02	0.7666982E-04	0.9227930E+02	0.1000000E+02	0.1000000E+06
1000	0.3339222E-04	0.6040287E-01	0.2344777E-02	0.9159918E-04	0.1484414E+03	0.1000000E+02	0.1000000E+06

p=n/10 j0=n-p
del_min = sig_min = x_low = lambda_low = 0.1000000E-02

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.1583546E-04	0.6340662E-01	0.1088826E-03	0.8200340E-05	0.1503906E+00	0.1000000E+02	0.1000000E+06
200	0.9554692E-05	0.1079602E-01	0.2663051E-03	0.1902390E-04	0.8203125E+00	0.1000000E+02	0.1000000E+06
300	0.2923516E-04	0.1443138E+00	0.9073146E-03	0.2845659E-04	0.8019531E+01	0.1000000E+02	0.1000000E+06
400	0.3050744E-04	0.6734320E-01	0.3518716E-03	0.4258939E-04	0.2591016E+02	0.1000000E+02	0.1000000E+06
500	0.2712602E-04	0.1079123E+00	0.6634208E-03	0.4719164E-04	0.2994922E+02	0.1000000E+02	0.1000000E+06
600	0.2374846E-04	0.7304189E-01	0.5900897E-03	0.5929102E-04	0.5623047E+02	0.1000000E+02	0.1000000E+06
700	0.4830972E-04	0.8213702E-01	0.1196915E-02	0.6503663E-04	0.6245898E+02	0.1000000E+02	0.1000000E+06
800	0.3885307E-04	0.9727522E-01	0.2749071E-02	0.7053870E-04	0.8238086E+02	0.1000000E+02	0.1000000E+06
900	0.4331112E-04	0.1212341E+00	0.1294614E-02	0.7195342E-04	0.1079004E+03	0.1000000E+02	0.1000000E+06
1000	0.2054614E-04	0.1579747E-01	0.6263436E-03	0.9755940E-04	0.1555801E+03	0.1000000E+02	0.1000000E+06

p=n/10 j0=n-p
del_min = sig_min = x_low = lambda_low = 0.1000000E-03

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.3586406E-04	0.3692899E-01	0.1005598E-02	0.1097735E-04	0.1601562E+00	0.1000000E+02	0.1000000E+06
200	0.1641122E-04	0.6065000E-02	0.6720227E-03	0.2209042E-04	0.1160156E+01	0.1000000E+02	0.1000000E+06

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  300 0.1783986E-04   0.1334555E+00   0.4819826E-03   0.2787335E-04   0.4128906E+01   0.1000000E+02   0.1000000E+06
  400 0.2398794E-04   0.3411546E-01   0.5153900E-03   0.4207971E-04   0.1933984E+02   0.1000000E+02   0.1000000E+06
  500 0.4670336E-04   0.8516116E-01   0.1086276E-02   0.4428020E-04   0.2779102E+02   0.1000000E+02   0.1000000E+06
  600 0.1535858E-04   0.4915023E-01   0.1142143E-02   0.5631614E-04   0.4532031E+02   0.1000000E+02   0.1000000E+06
  700 0.5392431E-04   0.1817297E+00   0.1770787E-02   0.7428499E-04   0.7766016E+02   0.1000000E+02   0.1000000E+06
  800 0.2663287E-04   0.2694696E-01   0.7384106E-03   0.7985751E-04   0.8363867E+02   0.1000000E+02   0.1000000E+06
  900 0.2485822E-04   0.7084114E-01   0.3066518E-02   0.8357452E-04   0.1236504E+03   0.1000000E+02   0.1000000E+06
 1000 0.2379061E-04   0.3550580E-01   0.8200449E-03   0.8834013E-04   0.1464609E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err          l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.2771594E-04   0.6916576E-03   0.1339157E-03   0.5312655E-04   0.7792969E+00   0.1000000E+02   0.1000000E+06
  200 0.2951445E-04   0.9842967E-03   0.1931432E-03   0.1099760E-03   0.2539062E+01   0.1000000E+02   0.1000000E+06
  300 0.3184624E-04   0.6447344E-03   0.1550740E-03   0.1331929E-03   0.6701172E+01   0.1000000E+02   0.1000000E+06
  400 0.2708858E-04   0.5752553E-03   0.1412552E-03   0.1963740E-03   0.1247070E+02   0.1000000E+02   0.1000000E+06
  500 0.2816418E-04   0.5669632E-03   0.1163474E-03   0.2537086E-03   0.1923047E+02   0.1000000E+02   0.1000000E+06
  600 0.2039183E-04   0.1778354E-03   0.4571236E-04   0.2951966E-03   0.3031055E+02   0.1000000E+02   0.1000000E+06
  700 0.2617354E-04   0.5939964E-03   0.1509364E-03   0.3698104E-03   0.4080078E+02   0.1000000E+02   0.1000000E+06
  800 0.2883852E-04   0.2031732E-03   0.5073130E-04   0.4040653E-03   0.5529102E+02   0.1000000E+02   0.1000000E+06
  900 0.2435287E-04   0.3614016E-03   0.7615863E-04   0.4681579E-03   0.6801953E+02   0.1000000E+02   0.1000000E+06
 1000 0.2741067E-04   0.4083967E-03   0.1000526E-03   0.5254676E-03   0.8287891E+02   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err          l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.1264388E-03   0.1586522E-02   0.2571342E-03   0.5055649E-04   0.1541016E+01   0.1000000E+02   0.1000000E+06
  200 0.1111464E-03   0.1050805E-02   0.9171208E-04   0.1056305E-03   0.3861328E+01   0.1000000E+02   0.1000000E+06
  300 0.1119414E-03   0.9504506E-03   0.1173609E-03   0.1519717E-03   0.9619141E+01   0.1000000E+02   0.1000000E+06
  400 0.9528715E-04   0.1192893E-02   0.1641478E-03   0.2020234E-03   0.1986133E+02   0.1000000E+02   0.1000000E+06
  500 0.1680162E-03   0.1172159E-02   0.1674438E-03   0.2484826E-03   0.3270898E+02   0.1000000E+02   0.1000000E+06
  600 0.1734038E-03   0.1374998E-02   0.1488022E-03   0.2926549E-03   0.5196875E+02   0.1000000E+02   0.1000000E+06
  700 0.2345116E-03   0.2045786E-02   0.3349624E-03   0.3705456E-03   0.5911133E+02   0.1000000E+02   0.1000000E+06
  800 0.1605679E-03   0.1427049E-02   0.1718010E-03   0.3848533E-03   0.9383008E+02   0.1000000E+02   0.1000000E+06
  900 0.1539441E-03   0.1680232E-02   0.2436795E-03   0.4610742E-03   0.1176699E+03   0.1000000E+02   0.1000000E+06
 1000 0.1429881E-03   0.2142500E-02   0.3091561E-03   0.5059853E-03   0.1576211E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err          l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.2724129E-03   0.6027422E-01   0.3598895E-03   0.5217081E-04   0.4380859E+01   0.1000000E+02   0.1000000E+06
  200 0.3168042E-03   0.5551244E-01   0.3496124E-03   0.9493057E-04   0.3800781E+01   0.1000000E+02   0.1000000E+06
  300 0.3913509E-03   0.5936906E-01   0.7075568E-03   0.1495978E-03   0.1314004E+03   0.1000000E+02   0.1000000E+06
  400 0.2202072E-03   0.6320499E-01   0.4275839E-03   0.1900680E-03   0.8606641E+02   0.1000000E+02   0.1000000E+06
  500 0.3203551E-03   0.6454771E-01   0.2683718E-03   0.2450884E-03   0.2817031E+03   0.1000000E+02   0.1000000E+06
  600 0.2010482E-03   0.4307591E-01   0.5232207E-03   0.2988744E-03   0.3402305E+03   0.1000000E+02   0.1000000E+06
  700 0.1758990E-03   0.5000032E-01   0.5078317E-03   0.3392873E-03   0.2394219E+03   0.1000000E+02   0.1000000E+06
  800 0.2086978E-03   0.4750240E-01   0.2975684E-03   0.3964443E-03   0.1900820E+03   0.1000000E+02   0.1000000E+06
  900 0.2223297E-03   0.3772276E-01   0.5503860E-03   0.4260643E-03   0.3494727E+03   0.1000000E+02   0.1000000E+06
 1000 0.1980174E-03   0.3211711E-01   0.3022019E-03   0.4850480E-03   0.1372305E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err          l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.5714409E-03   0.1849576E+00   0.9718849E-04   0.5246031E-04   0.9609375E+00   0.1000000E+02   0.1000000E+06
  200 0.9363322E-04   0.3641575E-01   0.8823115E-04   0.9186461E-04   0.6969922E+02   0.1000000E+02   0.1000000E+06
  300 0.2841498E-03   0.9656056E-01   0.3421719E-03   0.1599807E-03   0.5870703E+02   0.1000000E+02   0.1000000E+06
  400 0.2246152E-03   0.1064839E+00   0.1587116E-03   0.2004996E-03   0.1733984E+02   0.1000000E+02   0.1000000E+06
  500 0.2887929E-03   0.1427096E-01   0.3002246E-03   0.2541703E-03   0.3769141E+02   0.1000000E+02   0.1000000E+06
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  600 0.2315694E-03   0.1972515E-01   0.1943567E-03   0.2892986E-03   0.1138711E+03   0.1000000E+02   0.1000000E+06
  700 0.3143931E-03   0.2942193E-01   0.6094269E-03   0.3521332E-03   0.2664805E+03   0.1000000E+02   0.1000000E+06
  800 0.2439194E-03   0.5002249E-01   0.2895787E-03   0.4143419E-03   0.4749492E+03   0.1000000E+02   0.1000000E+06
  900 0.2732485E-03   0.5522046E-01   0.4889609E-03   0.4492109E-03   0.3006680E+03   0.1000000E+02   0.1000000E+06
 1000 0.2577508E-03   0.4991947E-01   0.4905621E-03   0.5078099E-03   0.8789805E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err          l_err      infeasibility     time used    penalty_param   smoothing_param
  100 0.3584428E-04   0.9636378E-03   0.1944405E-03   0.4872522E-04   0.8085938E+00   0.1000000E+02   0.1000000E+06
  200 0.3438869E-04   0.1716141E-02   0.3573491E-03   0.1083529E-03   0.2910156E+01   0.1000000E+02   0.1000000E+06
  300 0.2791198E-04   0.4553221E-03   0.9969587E-04   0.1510656E-03   0.6941406E+01   0.1000000E+02   0.1000000E+06
  400 0.2532425E-04   0.2410036E-03   0.6035671E-04   0.2057006E-03   0.1345312E+02   0.1000000E+02   0.1000000E+06
  500 0.3505210E-04   0.7206160E-03   0.1784079E-03   0.2602486E-03   0.2076953E+02   0.1000000E+02   0.1000000E+06
  600 0.3017675E-04   0.4699021E-03   0.1057665E-03   0.3028897E-03   0.3210156E+02   0.1000000E+02   0.1000000E+06
  700 0.3259279E-04   0.9641515E-03   0.1794782E-03   0.3584545E-03   0.4067969E+02   0.1000000E+02   0.1000000E+06
  800 0.3544793E-04   0.4543587E-03   0.1061342E-03   0.4109581E-03   0.5561719E+02   0.1000000E+02   0.1000000E+06
  900 0.3129138E-04   0.5143742E-03   0.1164153E-03   0.4528889E-03   0.6894141E+02   0.1000000E+02   0.1000000E+06
 1000 0.2877380E-04   0.4671292E-03   0.1264911E-03   0.4945115E-03   0.9153125E+02   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err          l_err      infeasibility     time used    penalty_param   smoothing_param
  100 0.4690272E-04   0.1442516E-02   0.2685139E-03   0.5268641E-04   0.9882812E+00   0.1000000E+02   0.1000000E+06
  200 0.9031302E-04   0.1282277E-02   0.1480492E-03   0.9763968E-04   0.3847656E+01   0.1000000E+02   0.1000000E+06
  300 0.1334459E-03   0.2092759E-02   0.3797873E-03   0.1581217E-03   0.1219141E+02   0.1000000E+02   0.1000000E+06
  400 0.8881950E-04   0.9731390E-03   0.1337700E-03   0.2012243E-03   0.2437891E+02   0.1000000E+02   0.1000000E+06
  500 0.9591814E-04   0.1395818E-02   0.1692450E-03   0.2367386E-03   0.4283984E+02   0.1000000E+02   0.1000000E+06
  600 0.1237583E-03   0.1542495E-02   0.1712946E-03   0.3125855E-03   0.6231250E+02   0.1000000E+02   0.1000000E+06
  700 0.9830363E-04   0.1307578E-02   0.2400637E-03   0.3395743E-03   0.8487109E+02   0.1000000E+02   0.1000000E+06
  800 0.1031766E-03   0.2062001E-02   0.2935933E-03   0.4000667E-03   0.1172891E+03   0.1000000E+02   0.1000000E+06
  900 0.9359654E-04   0.1495089E-02   0.2275562E-03   0.4390175E-03   0.1411016E+03   0.1000000E+02   0.1000000E+06
 1000 0.8766068E-04   0.1169926E-02   0.1970201E-03   0.5002086E-03   0.1884102E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err          l_err      infeasibility     time used    penalty_param   smoothing_param
  100 0.1646734E-03   0.2913432E-02   0.2871407E-03   0.5379417E-04   0.8085938E+00   0.1000000E+02   0.1000000E+06
  200 0.1354726E-03   0.1454971E-01   0.3752797E-03   0.1019170E-03   0.3898438E+01   0.1000000E+02   0.1000000E+06
  300 0.1386975E-03   0.9521793E-02   0.3088024E-03   0.1525535E-03   0.1812109E+02   0.1000000E+02   0.1000000E+06
  400 0.1185174E-03   0.1380149E-01   0.4906951E-03   0.1957350E-03   0.3641016E+02   0.1000000E+02   0.1000000E+06
  500 0.1982599E-03   0.2951749E-01   0.2665967E-03   0.2437786E-03   0.2304375E+03   0.1000000E+02   0.1000000E+06
  600 0.1536765E-03   0.1777044E-01   0.3114669E-03   0.2941151E-03   0.1522070E+03   0.1000000E+02   0.1000000E+06
  700 0.8905550E-04   0.1615846E-01   0.2567524E-03   0.3482194E-03   0.2340781E+03   0.1000000E+02   0.1000000E+06
  800 0.1110825E-03   0.1801141E-01   0.4580887E-03   0.4081278E-03   0.2713203E+03   0.1000000E+02   0.1000000E+06
  900 0.7680676E-04   0.7583208E-02   0.3876755E-03   0.4219147E-03   0.1658867E+03   0.1000000E+02   0.1000000E+06
 1000 0.1426036E-03   0.2288016E-01   0.4773285E-03   0.5056332E-03   0.5374102E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err          l_err      infeasibility     time used    penalty_param   smoothing_param
  100 0.8252632E-04   0.1315981E+00   0.1991312E-03   0.4699393E-04   0.7382812E+00   0.1000000E+02   0.1000000E+06
  200 0.8001611E-04   0.1457304E+00   0.1469721E-03   0.1062086E-03   0.9742188E+01   0.1000000E+02   0.1000000E+06
  300 0.9260186E-04   0.4823766E-01   0.1358771E-03   0.1553496E-03   0.1098828E+02   0.1000000E+02   0.1000000E+06
  400 0.1988078E-03   0.1111870E+00   0.2576711E-03   0.1953760E-03   0.1654180E+03   0.1000000E+02   0.1000000E+06
  500 0.1520185E-03   0.4742376E-01   0.3867870E-03   0.2433360E-03   0.1470586E+03   0.1000000E+02   0.1000000E+06
  600 0.1336103E-03   0.3769430E-01   0.3367239E-03   0.2888190E-03   0.8642969E+02   0.1000000E+02   0.1000000E+06
  700 0.1642108E-03   0.7364788E-01   0.3931671E-03   0.3457153E-03   0.2823984E+03   0.1000000E+02   0.1000000E+06
  800 0.2071421E-03   0.9330046E-01   0.4741411E-03   0.3959645E-03   0.5244531E+03   0.1000000E+02   0.1000000E+06
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  900 0.1134647E-03   0.2390601E-01   0.3752277E-03   0.4522829E-03   0.1751602E+03   0.1000000E+02   0.1000000E+06
 1000 0.1445290E-03   0.1891806E-01   0.3934477E-03   0.5029689E-03   0.7512500E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err          l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.8034464E-04   0.2475763E-01   0.5619342E-02   0.5042787E-04   0.2632812E+01   0.1000000E+02   0.1000000E+06
  200 0.1502395E-04   0.9206436E-03   0.2112726E-03   0.9444719E-04   0.8867188E+01   0.1000000E+02   0.1000000E+06
  300 0.2911458E-04   0.2043402E-01   0.3598905E-02   0.1525520E-03   0.2495312E+02   0.1000000E+02   0.1000000E+06
  400 0.4789043E-04   0.2207795E-01   0.4187448E-02   0.2056602E-03   0.3873438E+02   0.1000000E+02   0.1000000E+06
  500 0.3373179E-04   0.6314579E-01   0.1294357E-01   0.2332792E-03   0.7000000E+02   0.1000000E+02   0.1000000E+06
  600 0.4715527E-04   0.3471764E-02   0.8078988E-03   0.2943242E-03   0.1052188E+03   0.1000000E+02   0.1000000E+06
  700 0.4341549E-04   0.4444885E-02   0.8727259E-03   0.3518213E-03   0.1711484E+03   0.1000000E+02   0.1000000E+06
  800 0.3651326E-04   0.1281046E-01   0.3098219E-02   0.3969926E-03   0.2155781E+03   0.1000000E+02   0.1000000E+06
  900 0.3947182E-04   0.2309616E-01   0.5263003E-02   0.4380155E-03   0.1523047E+03   0.1000000E+02   0.1000000E+06
 1000 0.3559798E-04   0.1359160E-01   0.3203085E-02   0.5209050E-03   0.4036797E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err          l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.6253433E-04   0.1118868E+00   0.3339068E-02   0.4335921E-04   0.1359375E+01   0.1000000E+02   0.1000000E+06
  200 0.2512312E-04   0.4257268E-02   0.2437867E-03   0.9684659E-04   0.6960938E+01   0.1000000E+02   0.1000000E+06
  300 0.5377200E-04   0.1958648E-01   0.2015927E-02   0.1522516E-03   0.2767188E+02   0.1000000E+02   0.1000000E+06
  400 0.6627285E-04   0.6584637E-01   0.3902290E-02   0.1966162E-03   0.6464062E+02   0.1000000E+02   0.1000000E+06
  500 0.8729380E-04   0.4549025E-01   0.2050407E-02   0.2564674E-03   0.1252422E+03   0.1000000E+02   0.1000000E+06
  600 0.6218256E-04   0.2091057E-01   0.9951949E-03   0.2928416E-03   0.1453359E+03   0.1000000E+02   0.1000000E+06
  700 0.5326650E-04   0.4655203E-01   0.2911994E-02   0.3296409E-03   0.1726328E+03   0.1000000E+02   0.1000000E+06
  800 0.6434002E-04   0.2391457E-01   0.2053143E-02   0.3942255E-03   0.3004531E+03   0.1000000E+02   0.1000000E+06
  900 0.6105002E-04   0.5941706E-01   0.4257929E-02   0.4412102E-03   0.3175000E+03   0.1000000E+02   0.1000000E+06
 1000 0.5427304E-04   0.5988519E-01   0.4677972E-02   0.5090888E-03   0.3667578E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err          l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.1090448E-04   0.4831425E-01   0.9275623E-04   0.4519063E-04   0.8515625E+00   0.1000000E+02   0.1000000E+06
  200 0.1201636E-03   0.9046588E-01   0.1269303E-02   0.9839858E-04   0.1379688E+02   0.1000000E+02   0.1000000E+06
  300 0.7446760E-04   0.1092649E+00   0.7868656E-03   0.1396234E-03   0.3857031E+02   0.1000000E+02   0.1000000E+06
  400 0.4256001E-04   0.4510226E-01   0.1500935E-02   0.2038514E-03   0.6370312E+02   0.1000000E+02   0.1000000E+06
  500 0.7451800E-04   0.9340696E-01   0.1665259E-02   0.2452428E-03   0.9605469E+02   0.1000000E+02   0.1000000E+06
  600 0.5403749E-04   0.1436983E-01   0.7361495E-03   0.2908349E-03   0.1252734E+03   0.1000000E+02   0.1000000E+06
  700 0.6353052E-04   0.3111231E-01   0.7621719E-03   0.3527393E-03   0.2073594E+03   0.1000000E+02   0.1000000E+06
  800 0.6760594E-04   0.4656336E-01   0.2073130E-02   0.3971148E-03   0.2899062E+03   0.1000000E+02   0.1000000E+06
  900 0.3742588E-04   0.1369346E-01   0.1072270E-02   0.4593459E-03   0.3941484E+03   0.1000000E+02   0.1000000E+06
 1000 0.5256310E-04   0.3842257E-01   0.7312514E-03   0.4868780E-03   0.6145391E+03   0.1000000E+02   0.1000000E+06


#  p=n/2   j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err          l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.4158285E-04   0.2138577E-01   0.2145168E-03   0.5592123E-04   0.1109375E+01   0.1000000E+02   0.1000000E+06
  200 0.7384751E-04   0.9648873E-01   0.1285470E-02   0.9291392E-04   0.1232812E+02   0.1000000E+02   0.1000000E+06
  300 0.5975573E-04   0.8029841E-01   0.7083656E-03   0.1598754E-03   0.2814062E+02   0.1000000E+02   0.1000000E+06
  400 0.7221795E-04   0.6233422E-01   0.2337705E-02   0.2010917E-03   0.7697656E+02   0.1000000E+02   0.1000000E+06
  500 0.5362702E-04   0.5831347E-01   0.8211894E-03   0.2501232E-03   0.8976562E+02   0.1000000E+02   0.1000000E+06
  600 0.9707966E-04   0.7040046E-01   0.1265940E-02   0.2802408E-03   0.2002422E+03   0.1000000E+02   0.1000000E+06
  700 0.6763968E-04   0.6021643E-01   0.1742789E-02   0.3541088E-03   0.2205469E+03   0.1000000E+02   0.1000000E+06
  800 0.4999075E-04   0.2254444E-01   0.1216792E-02   0.3982047E-03   0.3056250E+03   0.1000000E+02   0.1000000E+06
  900 0.8962837E-04   0.5187304E-01   0.1968252E-02   0.4378507E-03   0.5739688E+03   0.1000000E+02   0.1000000E+06
 1000 0.7873894E-04   0.4769799E-01   0.1606749E-02   0.4945519E-03   0.4553984E+03   0.1000000E+02   0.1000000E+06
```

```
#  p=7n/10 j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
# n=       x_err           mu_err          l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.1266657E-04   0.3018233E-03   0.8598846E-04   0.7184139E-04   0.8906250E+00   0.1000000E+02   0.1000000E+06
  200 0.2841038E-04   0.1776883E-03   0.5772914E-04   0.1434239E-03   0.3421875E+01   0.1000000E+02   0.1000000E+06
  300 0.3008874E-04   0.3353499E-03   0.9003685E-04   0.2190941E-03   0.8359375E+01   0.1000000E+02   0.1000000E+06
  400 0.2890202E-04   0.4295269E-03   0.1204665E-03   0.2835843E-03   0.1448438E+02   0.1000000E+02   0.1000000E+06
  500 0.2283749E-04   0.1228188E-03   0.3622793E-04   0.3368436E-03   0.2456250E+02   0.1000000E+02   0.1000000E+06
  600 0.3173525E-04   0.2202954E-03   0.7242443E-04   0.4176665E-03   0.3660938E+02   0.1000000E+02   0.1000000E+06
  700 0.2659044E-04   0.3736943E-03   0.9541248E-04   0.4950336E-03   0.4870312E+02   0.1000000E+02   0.1000000E+06
  800 0.3025453E-04   0.3720710E-03   0.1059913E-03   0.5813583E-03   0.6136719E+02   0.1000000E+02   0.1000000E+06
  900 0.3060095E-04   0.4733168E-03   0.1289947E-03   0.6210565E-03   0.8307812E+02   0.1000000E+02   0.1000000E+06
 1000 0.1675327E-04   0.3467318E-03   0.9618824E-04   0.7044560E-03   0.1045391E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err          l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.1345568E-03   0.1332393E-02   0.2423457E-03   0.7226523E-04   0.1632812E+01   0.1000000E+02   0.1000000E+06
  200 0.2275710E-03   0.2933509E-02   0.4089163E-03   0.1384228E-03   0.5398438E+01   0.1000000E+02   0.1000000E+06
  300 0.1095807E-03   0.9278906E-03   0.1415411E-03   0.2054197E-03   0.1602344E+02   0.1000000E+02   0.1000000E+06
  400 0.1733720E-03   0.1019639E-02   0.1506165E-03   0.2747697E-03   0.2156250E+02   0.1000000E+02   0.1000000E+06
  500 0.1514853E-03   0.1133427E-02   0.1348686E-03   0.3647348E-03   0.4579688E+02   0.1000000E+02   0.1000000E+06
  600 0.2952276E-03   0.2136276E-02   0.2393695E-03   0.4199094E-03   0.7127344E+02   0.1000000E+02   0.1000000E+06
  700 0.1276985E-03   0.1001287E-02   0.1834833E-03   0.4918134E-03   0.7796094E+02   0.1000000E+02   0.1000000E+06
  800 0.1704606E-03   0.1219756E-02   0.2069559E-03   0.5475408E-03   0.1007969E+03   0.1000000E+02   0.1000000E+06
  900 0.1554335E-03   0.1115205E-02   0.1482591E-03   0.6552319E-03   0.1612422E+03   0.1000000E+02   0.1000000E+06
 1000 0.1810707E-03   0.8105262E-03   0.1509377E-03   0.6888892E-03   0.1555547E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err          l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.2980250E-03   0.5715485E-01   0.2276800E-03   0.6703336E-04   0.2549219E+02   0.1000000E+02   0.1000000E+06
  200 0.3307346E-03   0.3570613E-01   0.5202181E-03   0.1375188E-03   0.1296094E+02   0.1000000E+02   0.1000000E+06
  300 0.3405177E-03   0.4892360E-01   0.5324425E-03   0.2048333E-03   0.3384375E+02   0.1000000E+02   0.1000000E+06
  400 0.5118287E-03   0.4804449E-01   0.4620352E-03   0.2766915E-03   0.3213516E+03   0.1000000E+02   0.1000000E+06
  500 0.2631978E-03   0.2359906E-01   0.6182587E-03   0.3681163E-03   0.2518125E+03   0.1000000E+02   0.1000000E+06
  600 0.2267756E-03   0.4238223E-01   0.6192375E-03   0.4080085E-03   0.1449531E+03   0.1000000E+02   0.1000000E+06
  700 0.4950560E-03   0.3516847E-01   0.3554568E-03   0.5088292E-03   0.1642070E+04   0.1000000E+02   0.1000000E+06
  800 0.2449118E-03   0.2945709E-01   0.2147184E-03   0.5618117E-03   0.7748516E+03   0.1000000E+02   0.1000000E+06
  900 0.1799005E-03   0.2593495E-01   0.2330798E-03   0.6315890E-03   0.5343359E+03   0.1000000E+02   0.1000000E+06
 1000 0.2311359E-03   0.3045438E-01   0.4599713E-03   0.7058907E-03   0.1587266E+04   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=(n-p)/4
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err          l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.1606038E-03   0.5835902E-01   0.7369948E-04   0.6452296E-04   0.9531250E+00   0.1000000E+02   0.1000000E+06
  200 0.5115451E-03   0.6367135E-01   0.2139515E-03   0.1415678E-03   0.6351562E+02   0.1000000E+02   0.1000000E+06
  300 0.3712981E-03   0.3492884E-01   0.2257785E-03   0.2028782E-03   0.2028125E+02   0.1000000E+02   0.1000000E+06
  400 0.2623378E-03   0.4698406E-01   0.1868374E-03   0.2814343E-03   0.4630469E+02   0.1000000E+02   0.1000000E+06
  500 0.2804008E-03   0.1220775E-01   0.1886076E-03   0.3404074E-03   0.6607031E+02   0.1000000E+02   0.1000000E+06
  600 0.4225008E-03   0.5550867E-01   0.4072192E-03   0.4395120E-03   0.2569688E+03   0.1000000E+02   0.1000000E+06
  700 0.1283178E-03   0.1195432E-01   0.1114958E-03   0.5085243E-03   0.1279297E+03   0.1000000E+02   0.1000000E+06
  800 0.2708467E-03   0.3688971E-01   0.2486881E-03   0.5718212E-03   0.4162812E+03   0.1000000E+02   0.1000000E+06
  900 0.2356311E-03   0.3260467E-01   0.2848870E-03   0.6613215E-03   0.8410859E+03   0.1000000E+02   0.1000000E+06
 1000 0.1915272E-03   0.5044556E-01   0.2482636E-03   0.7029010E-03   0.3979375E+03   0.1000000E+02   0.1000000E+06


#  p=7n/10 j0=(n-p)/2
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E+00
```

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.6506496E-05	0.1295212E-03	0.5249335E-04	0.6701055E-04	0.1007812E+01	0.1000000E+02	0.1000000E+06
200	0.1640014E-04	0.2004377E-03	0.4943803E-04	0.1382443E-03	0.3398438E+01	0.1000000E+02	0.1000000E+06
300	0.3486590E-04	0.4076871E-03	0.9480517E-04	0.2261017E-03	0.8984375E+01	0.1000000E+02	0.1000000E+06
400	0.3307709E-04	0.6677337E-03	0.1979238E-03	0.2818272E-03	0.1695312E+02	0.1000000E+02	0.1000000E+06
500	0.2382124E-04	0.2685281E-03	0.6749533E-04	0.3565597E-03	0.2628906E+02	0.1000000E+02	0.1000000E+06
600	0.3107930E-04	0.6375224E-03	0.1658544E-03	0.4060113E-03	0.3805469E+02	0.1000000E+02	0.1000000E+06
700	0.2786725E-04	0.3974296E-03	0.1069028E-03	0.4959724E-03	0.5185156E+02	0.1000000E+02	0.1000000E+06
800	0.4114131E-04	0.7051757E-03	0.1777018E-03	0.5615271E-03	0.6760156E+02	0.1000000E+02	0.1000000E+06
900	0.3270561E-04	0.2688352E-03	0.7644284E-04	0.6097910E-03	0.8946094E+02	0.1000000E+02	0.1000000E+06
1000	0.3645809E-04	0.5440460E-03	0.1380744E-03	0.6790538E-03	0.1198516E+03	0.1000000E+02	0.1000000E+06

p=7n/10 j0=(n-p)/2

del_min = sig_min = x_low = lambda_low = 0.1000000E-01

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.1052327E-03	0.1915729E-02	0.1877352E-03	0.7464757E-04	0.2414062E+01	0.1000000E+02	0.1000000E+06
200	0.9855608E-04	0.1418770E-02	0.3051401E-03	0.1425864E-03	0.4921875E+01	0.1000000E+02	0.1000000E+06
300	0.8516749E-04	0.1143718E-02	0.2297518E-03	0.2097868E-03	0.1531250E+02	0.1000000E+02	0.1000000E+06
400	0.9623122E-04	0.1291527E-02	0.2272227E-03	0.2707321E-03	0.3180469E+02	0.1000000E+02	0.1000000E+06
500	0.1050652E-03	0.1192189E-02	0.1774003E-03	0.3459925E-03	0.5334375E+02	0.1000000E+02	0.1000000E+06
600	0.8944736E-04	0.1264352E-02	0.2413289E-03	0.4161844E-03	0.8020312E+02	0.1000000E+02	0.1000000E+06
700	0.1010855E-03	0.9810709E-03	0.1757082E-03	0.4909290E-03	0.1028281E+03	0.1000000E+02	0.1000000E+06
800	0.7709161E-04	0.8219040E-03	0.2001030E-03	0.5671613E-03	0.9843750E+02	0.1000000E+02	0.1000000E+06
900	0.8571805E-04	0.8510007E-03	0.1169363E-03	0.6503373E-03	0.1627578E+03	0.1000000E+02	0.1000000E+06
1000	0.1065700E-03	0.1745756E-02	0.2506989E-03	0.6889343E-03	0.2320078E+03	0.1000000E+02	0.1000000E+06

p=7n/10 j0=(n-p)/2

del_min = sig_min = x_low = lambda_low = 0.1000000E-02

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.8402520E-04	0.1565025E-02	0.3920061E-03	0.6667171E-04	0.1968750E+01	0.1000000E+02	0.1000000E+06
200	0.1625558E-03	0.7162628E-02	0.3853911E-03	0.1516026E-03	0.7875000E+01	0.1000000E+02	0.1000000E+06
300	0.1037823E-03	0.1473354E-01	0.3214070E-03	0.2016222E-03	0.1096094E+02	0.1000000E+02	0.1000000E+06
400	0.1109377E-03	0.1407930E-02	0.1852831E-03	0.2734079E-03	0.2950781E+02	0.1000000E+02	0.1000000E+06
500	0.9345569E-04	0.1407670E-01	0.2487747E-03	0.3522414E-03	0.8217969E+02	0.1000000E+02	0.1000000E+06
600	0.1545997E-03	0.1674839E-01	0.2366856E-03	0.4132372E-03	0.1336484E+03	0.1000000E+02	0.1000000E+06
700	0.1632646E-03	0.1246712E-01	0.2643976E-03	0.4857673E-03	0.5156797E+03	0.1000000E+02	0.1000000E+06
800	0.1866343E-03	0.1524312E-01	0.6611380E-03	0.5619198E-03	0.5075703E+03	0.1000000E+02	0.1000000E+06
900	0.1170143E-03	0.1530553E-01	0.4280980E-03	0.6435063E-03	0.4659688E+03	0.1000000E+02	0.1000000E+06
1000	0.1568089E-03	0.1644361E-01	0.3665010E-03	0.6991191E-03	0.8298906E+03	0.1000000E+02	0.1000000E+06

p=7n/10 j0=(n-p)/2

del_min = sig_min = x_low = lambda_low = 0.1000000E-03

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.9994193E-04	0.5295351E-02	0.1650406E-03	0.6575403E-04	0.2093750E+01	0.1000000E+02	0.1000000E+06
200	0.1441184E-03	0.3853007E-01	0.2359604E-03	0.1326223E-03	0.1365625E+02	0.1000000E+02	0.1000000E+06
300	0.2198967E-03	0.5818273E-01	0.6461529E-03	0.2174675E-03	0.8403125E+02	0.1000000E+02	0.1000000E+06
400	0.9065710E-04	0.6031313E-01	0.4355000E-03	0.2741505E-03	0.8098438E+02	0.1000000E+02	0.1000000E+06
500	0.1499605E-03	0.2640618E-01	0.2601167E-03	0.3577762E-03	0.1128281E+03	0.1000000E+02	0.1000000E+06
600	0.1012129E-03	0.4148188E-01	0.3352317E-03	0.4153283E-03	0.1557812E+03	0.1000000E+02	0.1000000E+06
700	0.9264104E-04	0.1474384E-01	0.2336371E-03	0.4703873E-03	0.2251875E+03	0.1000000E+02	0.1000000E+06
800	0.8912876E-04	0.2424991E-01	0.2919134E-03	0.5464081E-03	0.3921719E+03	0.1000000E+02	0.1000000E+06
900	0.9791956E-04	0.2118746E-01	0.2737791E-03	0.6573894E-03	0.3032969E+03	0.1000000E+02	0.1000000E+06
1000	0.1495538E-03	0.4720621E-01	0.3287498E-03	0.6965136E-03	0.5824531E+03	0.1000000E+02	0.1000000E+06

p=7n/10 j0=n-p

del_min = sig_min = x_low = lambda_low = 0.1000000E+00

# n=	x_err	mu_err	l_err	infeasibility	time used	penalty_param	smoothing_param
100	0.5290444E-04	0.9670635E-02	0.2432088E-02	0.7449421E-04	0.4750000E+01	0.1000000E+02	0.1000000E+06
200	0.7759063E-04	0.4687018E-01	0.1122286E-01	0.1464376E-03	0.2471875E+02	0.1000000E+02	0.1000000E+06

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  300 0.2226661E-04   0.2171883E-01   0.5702205E-02   0.2143424E-03   0.2123438E+02   0.1000000E+02   0.1000000E+06
  400 0.3098708E-04   0.1128831E-01   0.2890929E-02   0.2781412E-03   0.3242188E+02   0.1000000E+02   0.1000000E+06
  500 0.3558699E-04   0.1195797E-01   0.3423988E-02   0.3534839E-03   0.9504688E+02   0.1000000E+02   0.1000000E+06
  600 0.5572849E-04   0.1477600E-01   0.3527646E-02   0.4165426E-03   0.1404219E+03   0.1000000E+02   0.1000000E+06
  700 0.3442536E-04   0.2607350E-01   0.6955097E-02   0.4944248E-03   0.1591562E+03   0.1000000E+02   0.1000000E+06
  800 0.6103669E-04   0.1574070E-01   0.4076505E-02   0.5678838E-03   0.3062031E+03   0.1000000E+02   0.1000000E+06
  900 0.3401662E-04   0.1438911E-01   0.3340795E-02   0.6222958E-03   0.3351094E+03   0.1000000E+02   0.1000000E+06
 1000 0.4080539E-04   0.1238679E-01   0.3615604E-02   0.6795289E-03   0.3622031E+03   0.1000000E+02   0.1000000E+06
```

```
#  p=7n/10 j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-01
# n=       x_err           mu_err           l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.1227382E-03   0.8322847E-01   0.4432104E-02   0.7722144E-04   0.3578125E+01   0.1000000E+02   0.1000000E+06
  200 0.9686498E-04   0.7298459E-02   0.6609445E-03   0.1349871E-03   0.2165625E+02   0.1000000E+02   0.1000000E+06
  300 0.8429706E-04   0.3090839E-01   0.2226897E-02   0.1982912E-03   0.3406250E+02   0.1000000E+02   0.1000000E+06
  400 0.3426939E-04   0.1617630E-01   0.1362898E-02   0.2797433E-03   0.5406250E+02   0.1000000E+02   0.1000000E+06
  500 0.6909599E-04   0.8309145E-02   0.6889625E-03   0.3413427E-03   0.1426094E+03   0.1000000E+02   0.1000000E+06
  600 0.5406925E-04   0.1709552E-01   0.1274275E-02   0.4197890E-03   0.2313281E+03   0.1000000E+02   0.1000000E+06
  700 0.4330223E-04   0.3718687E-01   0.2453496E-02   0.4951471E-03   0.2666562E+03   0.1000000E+02   0.1000000E+06
  800 0.6727029E-04   0.1101207E-01   0.9897640E-03   0.5729975E-03   0.3609531E+03   0.1000000E+02   0.1000000E+06
  900 0.6980711E-04   0.2526266E-01   0.1474585E-02   0.6448566E-03   0.6109688E+03   0.1000000E+02   0.1000000E+06
 1000 0.6048487E-04   0.2268580E-01   0.2488951E-02   0.7011919E-03   0.4500312E+03   0.1000000E+02   0.1000000E+06
```

```
#  p=7n/10 j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-02
# n=       x_err           mu_err           l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.9882708E-04   0.1010341E+00   0.9321600E-03   0.6334718E-04   0.5390625E+01   0.1000000E+02   0.1000000E+06
  200 0.8306705E-04   0.5252791E-01   0.1262842E-02   0.1448885E-03   0.3228125E+02   0.1000000E+02   0.1000000E+06
  300 0.4565216E-04   0.4263956E-01   0.9323263E-03   0.2197582E-03   0.2778125E+02   0.1000000E+02   0.1000000E+06
  400 0.6646278E-04   0.2505432E-01   0.8711106E-03   0.2754259E-03   0.7467188E+02   0.1000000E+02   0.1000000E+06
  500 0.4757135E-04   0.2335363E-01   0.4386151E-03   0.3468496E-03   0.1730625E+03   0.1000000E+02   0.1000000E+06
  600 0.6704662E-04   0.1259427E-01   0.6495671E-03   0.4229192E-03   0.2732812E+03   0.1000000E+02   0.1000000E+06
  700 0.5915053E-04   0.7420379E-01   0.1565832E-02   0.4908779E-03   0.3385938E+03   0.1000000E+02   0.1000000E+06
  800 0.6654550E-04   0.3959729E-01   0.1940339E-02   0.5520988E-03   0.3891094E+03   0.1000000E+02   0.1000000E+06
  900 0.6091118E-04   0.6386573E-01   0.1267891E-02   0.6362643E-03   0.4193438E+03   0.1000000E+02   0.1000000E+06
 1000 0.6492164E-04   0.6742674E-01   0.2165891E-02   0.7198880E-03   0.5369219E+03   0.1000000E+02   0.1000000E+06
```

```
#  p=7n/10 j0=n-p
#  del_min = sig_min = x_low = lambda_low  =  0.1000000E-03
# n=       x_err           mu_err           l_err      infeasibility    time used    penalty_param   smoothing_param
  100 0.7482820E-04   0.4191132E-01   0.2055761E-02   0.7319948E-04   0.3765625E+01   0.1000000E+02   0.1000000E+06
  200 0.4009266E-04   0.2695407E-01   0.6389350E-03   0.1397547E-03   0.1660938E+02   0.1000000E+02   0.1000000E+06
  300 0.7192002E-04   0.4185410E-01   0.1341782E-02   0.2226524E-03   0.1460938E+03   0.1000000E+02   0.1000000E+06
  400 0.3736479E-04   0.1099063E-01   0.1146760E-02   0.2757526E-03   0.6748438E+02   0.1000000E+02   0.1000000E+06
  500 0.4523188E-04   0.5432442E-01   0.2375261E-02   0.3432408E-03   0.1111094E+03   0.1000000E+02   0.1000000E+06
  600 0.6790050E-04   0.5175339E-01   0.1169180E-02   0.4058575E-03   0.1662031E+03   0.1000000E+02   0.1000000E+06
  700 0.4224342E-04   0.6847109E-01   0.7310878E-03   0.4996506E-03   0.1720625E+03   0.1000000E+02   0.1000000E+06
  800 0.5628370E-04   0.2232655E-01   0.1881621E-02   0.5605713E-03   0.3757188E+03   0.1000000E+02   0.1000000E+06
  900 0.8034405E-04   0.4123576E-01   0.1413243E-02   0.6257847E-03   0.4406562E+03   0.1000000E+02   0.1000000E+06
 1000 0.8779856E-04   0.5862557E-01   0.2052118E-02   0.6948079E-03   0.4640156E+03   0.1000000E+02   0.1000000E+06
```