

Homework 6

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2.4 P7

$$\begin{pmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 5 & 6 \\ 5 & 6 & 7 & 8 \\ 7 & 8 & 9 & 0 \end{pmatrix} = \begin{pmatrix} 5 & 6 & 7 & 8 \\ 3 & 4 & 5 & 6 \\ 7 & 8 & 9 & 0 \\ 1 & 2 & 3 & 4 \end{pmatrix}$$

2.4 P8

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix} \begin{pmatrix} 10 & 20 & 1 \\ 1 & 1.99 & 6 \\ 0 & 50 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0.1 & -0.0002 & 1 \end{pmatrix} \begin{pmatrix} 10 & 20 & 1 \\ 1 & 50 & 1 \\ 0 & 0 & 5.9002 \end{pmatrix}$$

0.1 is the largest needed multiplier.

2.5 CP1

$$\begin{pmatrix} 3 & -1 & & & \\ -1 & 3 & -1 & & \\ & \ddots & \ddots & \ddots & \\ & & -1 & 3 & 1 \\ & & & -1 & 3 \end{pmatrix} \begin{pmatrix} x_1 \\ \vdots \\ x_n \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \\ \vdots \\ 1 \\ 2 \end{pmatrix}$$

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>> norm(jacobi(A, b, 25)-1,inf)
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ans =
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1.446714834152374e-06
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>> norm(jacobi(A, b, 26)-1,inf)
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ans =
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9.498632749238567e-07
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It required 26 iterations to gain 6 digits of precision, and the backward error was 9.50×10^{-7} .