

Introduction to Numerical Methods for Engineers

Problem Set 3

Issued: February 24, 2005

Due: March 3, 2005

1. Solve the following set of linear equations using Gaussian elimination:

$$2x_1 + x_2 + 4x_3 = 16$$

$$3x_1 + 2x_2 + x_3 = 10$$

$$x_1 + 3x_2 + 3x_3 = 16.$$

2. a) Factor A into LU and solve $Ax = b$ for the 3 right sides:

$$A = \begin{bmatrix} 1 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}, \quad b = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

b) Verify that your solutions x_1, x_2, x_3 are the three columns of A^{-1} .
(A times this inverse matrix should give the identity matrix.)

3. Use Cramer's Rule to solve:

$$x_1 + x_2 + x_3 = 1$$

$$-2x_1 + x_2 = 0$$

$$-4x_1 + x_3 = 0.$$