Numerical Analysis HW7
Ch8 - 1,3,4,13 (pg267)
Ch9 - 1,6,8 (pg280)

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Problem 1. Determine the number of flops as a function of the number of equations n for

(a) factorization

(b) forward substitution

(c) back substitution

of LU factorization

Problem 3. Use naive Gauss elimination to factor the following system according to the description in Section 10.2:

$$\begin{aligned} 7x_1 + 2x_2 - 3x_3 &= -12 \\ 2x_1 + 5x_2 - 3x_3 &= -20 \\ x_1 - x_2 - 6x_3 &= -26 \end{aligned}$$

Then, multiply the resulting $[L]$ and $[U]$ matrices to determine that $[A]$ is produced.

Problem 4. Use LU factorization to solve the system of equations in Problem 3. Show all the steps of the computation. Also solve the system for the alternate right-vand-side vector

$$b = (12, 18, -6)$$

Problem 13. Use Cholesky factorization to determine $[U]$ so that

$$[A] = [U]^T[U] = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

Problem 1. Determine the matrix inverse for the following system:

$$\begin{aligned} 10x_1 + 2x_2 - x_3 &= 27 \\ -3x_1 - 6x_2 + 2x_3 &= -61.5 \\ x_1 + x_2 + 5x_3 &= -21.5 \end{aligned}$$

Check your results by verifying $[A][A]^{-1} = [I]$

Problem 6. Determine $\|A\|_f$, $\|A\|_1$, and $\|A\|_\infty$ for

$$[A] = \begin{bmatrix} 8 & 2 & -10 \\ -9 & 1 & 3 \\ 15 & -1 & 6 \end{bmatrix}$$

Before determining the norms, scale the matrix by making the maximum element in each row equal to one.

Problem 8. Use MATLAB to determine the spectral condition number for the following system. Do not normalize the system:

$$\begin{bmatrix} 1 & 4 & 9 & 16 & 25 \\ 4 & 9 & 16 & 25 & 36 \\ 9 & 16 & 25 & 36 & 49 \\ 16 & 25 & 36 & 49 & 64 \\ 25 & 36 & 49 & 64 & 81 \end{bmatrix}$$

Compute the condition number based on the row-sum norm.