

**Math 151A Homework #7** – practice homework.

**1. Pivoting strategies** (Section 6.2, problems 1c,2c,3c,4c)

Given the linear system

$$\begin{aligned}2x_1 - 3x_2 + 2x_3 &= 5 \\ -4x_1 + 2x_2 - 6x_3 &= 14 \\ 2x_1 + 2x_2 + 4x_3 &= 8\end{aligned}$$

find the row interchanges required when using:

- a. simple pivoting (algorithm 6.1)
- b. partial pivoting (algorithm 6.2)
- c. scaled partial pivoting (algorithm 6.3)
- d. complete pivoting

**2. LU factorization** Consider the linear system

$$\begin{aligned}2x_1 + x_2 + x_3 &= b_1 \\ -2x_1 - 1x_2 &= b_2 \\ 2x_1 + 3x_2 &= b_3\end{aligned}$$

The coefficient matrix for the system does not have an LU factorization. Using an appropriate permutation matrix, factor the resulting matrix ( $PA = LU$ ). Use this factorization to solve the system for  $\mathbf{x}$  when  $\mathbf{b} = (1, 2, 3)^T$ .

**3. Special matrices**

Which of the following matrices are

- i. symmetric
- ii. singular
- iii. strictly diagonally dominant

a.  $\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$

b.  $\begin{bmatrix} 2 & 1 & 0 \\ 0 & 3 & 0 \\ 1 & 0 & 4 \end{bmatrix}$

c.  $\begin{bmatrix} 4 & 2 & 6 \\ 3 & 0 & 7 \\ -2 & -1 & -3 \end{bmatrix}$