MATH 3110 - Fall 2017

Homework 2

Due: Thursday September 14

QUESTION 1. Chapter 2 of Strang

(total of 22 marks)

1. If P_1 and P_2 are permutation matrices, so is P_1P_2 . Give examples of:

(6 marks)

- matrices P_1, P_2 of size 3×3 such that $P_1P_2 \neq P_2P_1$, and
- matrices $P_3 \neq P_4$ of size 3×3 such the $P_3P_4 = P_4P_3$ when neither of the matrices is the either identity or the zero matrix.
- 2. Find the A = LU factorizations of the following matrix:

(6 marks)

$$A = \begin{pmatrix} 2 & -2 & 4 \\ 0 & -2 & 2 \\ 4 & 2 & 4 \end{pmatrix}$$

- 3. If A and B are symmetric matrices, which of the following matrices is symmetric? (Motivate the answer) (6 marks)
 - (a) $A^2 B^2$

- (b) (A + B)(A B)
- (c) ABAB
- 4. (a) Let $A = \begin{pmatrix} 1 & -1 & 1 \\ 5 & 1 & 1 \\ 1 & -1 & 2 \end{pmatrix}$. Find matrices B, C such that A = B + C with (2 marks)

$$\boldsymbol{B} = \boldsymbol{B}^T$$
 (symmetric), and $\boldsymbol{C} = -\boldsymbol{C}^T$ (anti-symmetric).

(b) Find formulas for B and C involving A and A^T . We want A = B + C, $B = B^T$ and $C = -C^T$. (2 marks)