# MATH 3110 - Fall 2017 

## Homework 2

Due: Thursday September 14

1. If $P_{1}$ and $P_{2}$ are permutation matrices, so is $P_{1} P_{2}$. Give examples of:

- matrices $P_{1}, P_{2}$ of size $3 \times 3$ such that $P_{1} P_{2} \neq P_{2} P_{1}$, and
- matrices $P_{3} \neq P_{4}$ of size $3 \times 3$ such the $P_{3} P_{4}=P_{4} P_{3}$ when neither of the matrices is the either identity or the zero matrix.

2. Find the $A=L U$ factorizations of the following matrix:

$$
A=\left(\begin{array}{ccc}
2 & -2 & 4 \\
0 & -2 & 2 \\
4 & 2 & 4
\end{array}\right)
$$

3. If $A$ and $B$ are symmetric matrices, which of the following matrices is symmetric? (Motivate the answer)
(a) $A^{2}-B^{2}$
(b) $(A+B)(A-B)$
(c) $A B A B$
4. (a) Let $A=\left(\begin{array}{ccc}1 & -1 & 1 \\ 5 & 1 & 1 \\ 1 & -1 & 2\end{array}\right)$. Find matrices $B, C$ such that $A=B+C$ with

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

(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)

