EconS 526- Homework #2 (Due on November 14th, 2018)

1. Show that if **A** and **B** are square matrices of the same order, then $\mathbf{A^2-B^2}$ is not in general equal to **(A+B)(A-B)**
2. Find all 2x2 matrices **A** such that $\mathbf{A^2}$ is the matrix obtained from **A** by squaring each entry.
3. Calculate **AB** when

$$A = \begin{vmatrix} a & b & c \\ 0 & d & e \\ 0 & 0 & f \end{vmatrix}, \quad B = \begin{vmatrix} 3 & -1 & 6 \\ 0 & 2 & 1 \\ 0 & 0 & -5 \end{vmatrix}$$

   i. What general result about upper triangular matrices does your result suggest?
   ii. What is the particular result for lower triangular matrices?

4. Let

$$A = \begin{vmatrix} 2 & -1 & 3 \\ 0 & -1 & 1 \\ 0 & 0 & 2 \end{vmatrix}, \quad B = \begin{vmatrix} 4 & 0 & 0 \\ 3 & -2 & 0 \\ 1 & 1 & -1 \end{vmatrix}, \quad C = \begin{vmatrix} -3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{vmatrix}$$

   and let *y* be a given 3-vector with components y_1, y_2, y_3.
   Solve each of the following systems of equations:
   i. Ax=y,
   ii. Bx=y
   iii. Cx=y

   What feature of the solution procedure distinguishes (iii) from (i) and (ii)?

5. Find the determinants of the following matrices, and show that $(ABC)^{-1}=C^{-1}B^{-1}A^{-1}$.

$$A = \begin{bmatrix} 1 & 5 & 6 \\ -1 & -4 & 4 \\ -2 & -7 & 9 \end{bmatrix}, B = \begin{bmatrix} 1 & 3 & 0 & 2 \\ -2 & -5 & 7 & 4 \\ 3 & 5 & 2 & 1 \\ -1 & 0 & -9 & -5 \end{bmatrix} and\ C = \begin{bmatrix} 1 & -1 & -3 & 0 \\ 0 & 1 & 0 & 4 \\ -1 & 2 & 8 & 5 \\ -1 & -1 & -2 & 3 \end{bmatrix}$$