ESC 251 **Homework 4** **Due: At end of class**

For this assignment, you should use the definitions:

$$A = \begin{pmatrix} 1 & 2 & -1 \\ -2 & 3 & 1 \\ 4 & 0 & 3 \end{pmatrix}; \quad B = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}; \quad x = \begin{pmatrix} 1 \\ -2 \\ 6 \end{pmatrix}; \quad y = \begin{pmatrix} -1 \\ 1 \\ -3 \end{pmatrix}.$$

Use MATLAB to answer Questions 1-4 below. You should copy your command window output into a Word document (like in HW 3). Add the answers to Questions 5-7 at the end.

1) (1 pt) Verify that $A \cdot B$ is not the same as $B \cdot A$.

2) (2 pts) Verify that $(A \cdot B)^T = B^T \cdot A^T$.

3) (2 pts) How could you generate *only* column 2 of $A \cdot B$ with a single MATLAB command?

4) (3 pts) Give the MATLAB command that will generate the matrix

$$\begin{pmatrix} 1 & 2 & -1 & -1 \\ -2 & 3 & 1 & 1 \\ 4 & 0 & 3 & -3 \\ 1 & -2 & 6 & 5 \end{pmatrix}.$$

   You should not enter this directly. Use your existing definitions for A, x and y along with the array construction operators `[` and `]` to do this.

5) (2 pts) *FLOP* stands for floating point operation and represents a single add, subtract, multiply or divide operation between two scalars. How many FLOPS does it take to compute a dot product of two vectors of length n?

6) (2 pts) How many FLOPS does it take to compute the matrix-vector product of an $n \times n$ matrix and a column vector of length n? Hint: First determine how many dot products are required, then use your answer from Question 5.

7) (2 pts) How many FLOPS does it take to compute the matrix-matrix product of two $n \times n$ matrices?