Matrices

Let a, b, and c be real non-zero numbers. Note: in Sage you will need to define a, b, and c as variables like you did in Lab0 (with "var('a','b','c')) Consider the matrices defined below for this worksheet:

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} \qquad B = \begin{bmatrix} 7 & 6 \\ 6 & 1 \\ 2 & 5 \end{bmatrix} \qquad C = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 4 & 0 \end{bmatrix}$$

$$E = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \qquad F = \begin{bmatrix} 7 & 6 & 0 \\ 6 & 1 & 5 \\ 0 & 5 & -2 \end{bmatrix}$$

$$\Omega = \begin{bmatrix} a & b \\ 0 & c \end{bmatrix} \qquad \Theta = \begin{bmatrix} a & 0 \\ 0 & a \end{bmatrix} \qquad \Phi = \begin{bmatrix} 0 & c \\ a & c \\ a & b \end{bmatrix}$$

1. Determine which of the following sums, differences, and products are defined. If they are, compute the result.

   $A + C$ $\qquad$ $\Phi + B$ $\qquad$ $B + \Phi$ $\qquad$ $\Omega - \Theta$

   AC $\qquad$ CA $\qquad$ FE $\qquad$ ΩA

2. Find the following:

   C^T $\qquad$ F^T $\qquad$ Θ^T $\qquad$ Φ^T

Definition 1. *A $n \times n$ matrix X is symmetric if $X = X^T$.*

3. Identify which of the matrices at the beginning of the worksheet are symmetric. Sage can do this by calling "X.is_symmetric()" where X is a matrix.