Homework

1. Find the transpose of the matrix $D = \begin{pmatrix} 1 & -2 \\ -3 & 4 \\ 5 & -1 \end{pmatrix}$

2. Verify that $(AB)^T = B^T A^T$ given $A = \begin{bmatrix} -1 & 1 & -2 \\ 2 & 0 & 1 \end{bmatrix}$; $B = \begin{bmatrix} -3 & 0 \\ 1 & 2 \\ 1 & -1 \end{bmatrix}$

3. Given the matrix $A = \begin{bmatrix} 4 & 2 & 1 \\ 0 & 2 & -1 \end{bmatrix}$

   a) Find $A^T A$, show it is symmetric
   b) Find AA^T, show it is symmetric

4. Find the power of A^{16} for the matrix

$$A = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & -1 \end{pmatrix}$$

5. Find the power of B^2 for the matrix $B = \begin{pmatrix} 9 & 0 \\ 0 & 4 \end{pmatrix}$

6. Prove that $(A+B)(A-B) \neq A^2 - B^2$

7. Prove that $(A+B)(A+B) \neq A^2 + 2AB + B^2$

8. Prove that if A is an $m \times n$ matrix, then AA^T and $A^T A$ are symmetric.

9. Let A and B be two $n \times n$ symmetric
   a) Give an example to show that the product AB is not symmetric symmetric.
   b) Prove that the product AB is symmetric if and only if $AB = BA$.