ENGR122 Assignment 3
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1. If $A = \begin{pmatrix} 1 & 1 \\ 3 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$, $C = \begin{pmatrix} -7 & 1 \\ 0 & 4 \end{pmatrix}$,

   $D = \begin{pmatrix} 3 & 2 & 1 \end{pmatrix}$ and $E = \begin{pmatrix} 2 & 3 & 4 \\ 1 & 2 & -1 \end{pmatrix}$ find if possible

   (a) $A + D$, $C - A$ and $D - E$

   (b) AB, BA, CA, AC, DA, DB, BD, EB, BE and AE

   (c) $7C$, $-3D$ and kE where k is a scalar.

2. Given that $A^2 = A \cdot A$ find A^2 and A^3 when $A = \begin{pmatrix} 4 & 2 \\ 1 & 3 \end{pmatrix}$.

3. Find AB and BA where

   $$A = \begin{pmatrix} 1 & 3 & 2 \\ -1 & 0 & 4 \\ 5 & 1 & -1 \end{pmatrix}, \quad B = \begin{pmatrix} 5 & 2 & 1 \\ 0 & 3 & 4 \\ 1 & 3 & 5 \end{pmatrix}$$

4. If $A = \begin{pmatrix} 2 & 1 & 3 \\ 4 & 2 & 1 \\ -1 & 3 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & -7 & 0 \\ 0 & 2 & 5 \\ 3 & 4 & 5 \end{pmatrix}$ find A^T, B^T, AB and $(AB)^T$. Deduce that

   $$(AB)^T = B^T A^T$$

5. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

   (a) find A^{-1}.

   (b) Find a, b such that $A + aA^{-1} = bI$

6. Given

   $$A = \begin{pmatrix} 3 & 7 & 6 \\ -2 & 1 & 0 \\ 4 & 2 & -5 \end{pmatrix}$$

   find $|A|$

7. Use Cramer's rule to solve the system

   $$2x - 3y + z = 0$$
   $$5x + 4y + z = 10$$
   $$2x - 2y - z = -1$$

8. Use Gaussian elimination to solve the system:

   $$2x + y - 3z = -5$$
   $$x - y + 2z = 12$$
   $$7x - 2y + 3z = 37$$

9. Find the inverse of the matrix

   $$A = \begin{pmatrix} 4 & 2 & 1 \\ 0 & 3 & 4 \\ -1 & 1 & 3 \end{pmatrix}$$

   using elimination.

10. Find the eigenvalues and the eigenvectors of the matrix

   $$A = \begin{pmatrix} 5 & 6 \\ 2 & 1 \end{pmatrix}$$

The marks are 16,4,10,8,10,10,10,12,10,10 for questions 1-10. Total is 100.