Instructions

- Answer each question completely; justify your answers.
- This assignment is due at 17:00 on Wednesday October 24th in Assignment Box #42.

1. Suppose that A is a 2×3 matrix such that $a_{ij} = 5i - j$. What is A?

2. Let $A = \begin{bmatrix} 2 & -4 \\ -1 & \frac{3}{4} \end{bmatrix}$ and $B = \begin{bmatrix} \frac{2}{3} & -2 \\ \frac{5}{6} & 7 \end{bmatrix}$.

   (a) Calculate AB.

   (b) Calculate BA.

   (c) Calculate $(A + B)^2$.

   (d) Calculate $A^2 + 2AB + B^2$.

3. Let $A = \begin{bmatrix} 1 & -3 & 4 \\ -2 & 1 & 0 \\ -3 & 2 & 1 \\ 7 & 2 & -3 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 \\ 2 & -1 \\ 4 & 2 \end{bmatrix}$.

   (a) If possible, calculate AB.

   (b) If possible, calculate BA.

   (c) If possible, calculate B^2.

   (d) If possible, calculate $B^T A^T$.

4. Consider the matrix $A = \begin{bmatrix} 0 & 2 & -1 \\ -2 & \sqrt{3} & 7 \\ 4 & -9 & 1 \end{bmatrix}$.

   (a) Calculate A^2.

   (b) Calculate $A^T A$.

   (c) Calculate $A A^T$.

5. Solve for k and ℓ: $\begin{bmatrix} 3k & 4\ell \\ 0 & 0 \end{bmatrix} \begin{bmatrix} -3 & 6 \\ 7 & 1 \end{bmatrix} = \begin{bmatrix} 13 & -40 \\ 0 & 0 \end{bmatrix}$

6. Let $A_1 = \begin{bmatrix} -3 & 7 \\ 4 & 8 \end{bmatrix}$ and $A_2 = \begin{bmatrix} 13 & 12 \\ 5 & -1 \end{bmatrix}$.

   Find all solutions for c_1 and c_2 such that $c_1 A_1 + c_2 A_2 = 0$.