

**MATH 1310: MATRICES FOR MANAGEMENT AND SOCIAL SCIENCES  
ASSIGNMENT 3**

1. [30] Consider the following matrices:

$$A = \begin{bmatrix} -4 & 1 & 1 \\ 2 & 0 & -2 \end{bmatrix} \quad B = \begin{bmatrix} 1 & -4 & 0 \\ -2 & 0 & 2 \\ -1 & -1 & 1 \end{bmatrix} \quad C = \begin{bmatrix} -1 & 4 \\ 3 & 2 \\ -3 & -2 \end{bmatrix}$$

$$D = \begin{bmatrix} 1 & -2 \\ -2 & 4 \\ 2 & -3 \end{bmatrix} \quad E = \begin{bmatrix} 2 & -3 & 2 \\ -1 & -1 & 2 \end{bmatrix}$$

Calculate, if possible, the following:

- (a)  $2E - 3A$  (b)  $AB + EB$  (c)  $B + DA$  (d)  $EB - D$  (e)  $E^t + D$   
(f)  $AC + I_2$  (g)  $(B - I_3)C$  (h)  $(AB)^2$  (i)  $C(A - E)$  (j)  $C^t B$

2. [10] Find the matrix  $M$  such that  $3N + 2M^t = S$ ,

$$\text{where } N = \begin{bmatrix} -2 & 0 \\ 1 & -1 \\ 1 & 4 \end{bmatrix} \text{ and } S = \begin{bmatrix} 2 & -2 \\ -3 & 0 \\ 1 & 4 \end{bmatrix}$$

3. [20] Consider the matrix  $A = \begin{bmatrix} 2 & 1 & 4 \\ 3 & 2 & 5 \\ 0 & -1 & 1 \end{bmatrix}$ .

(a) Find the inverse matrix  $A^{-1}$ . Show all your work and verify that your answer is correct.

(b) Use (a) to solve the system of linear equations

$$2x + y + 4z = 5$$

$$3x + 2y + 5z = 3$$

$$-y + z = 8$$

4. [20] The town of Saskreg has two industries: farming and oil production. A production of \$1 in farming requires 60 cents in farming and 20 cents in oil. On the other hand, a production of \$1 in oil requires 30 cents in farming and 50 cents in oil. There is an outside demand of \$3500 for farming products and \$2800 for oil products. Find the total production for each of the two industries.
5. [20] A small rural community is entirely self supporting. The members of the community are engaged in 3 types of occupations: livestock production, farming, and clothing production. The livestock producers keep  $\frac{3}{5}$  of the livestock for themselves, give  $\frac{1}{5}$  of their livestock to the farmers and  $\frac{1}{5}$  to the clothing producers. The farmers keep  $\frac{2}{5}$  of what they farm, give  $\frac{3}{10}$  to the livestock producers and  $\frac{3}{10}$  to the clothing producers. The clothing producers keep  $\frac{1}{2}$  of the clothes they produce, give  $\frac{1}{4}$  to the livestock producers and  $\frac{1}{4}$  to the farmers. What is a fair way to assign the values of the productions of livestock, farming and clothing ?