

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

[30] 1. Consider the following matrices:

$$A = \begin{bmatrix} 11 & -2 & 1 \\ 5 & 0 & 4 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 & -3 \\ 1 & 4 & 0 \\ 2 & 2 & -1 \end{bmatrix}, C = \begin{bmatrix} 3 & 1 \\ 4 & -1 \\ 0 & 2 \end{bmatrix}, D = \begin{bmatrix} 1 & 0 \\ 3 & 2 \\ -2 & 10 \end{bmatrix}, E = \begin{bmatrix} 0 & -1 & 5 \\ 1 & 2 & 1 \end{bmatrix}$$

Calculate, if possible, the following:

- (a) $2A - E$ (b) A^2 (c) $BC + BD$ (d) $B + CE$ (e) BD^t (f) $AD + I_2$
(g) $(B + I_3)C$ (h) $(AD)^2$ (i) $B(A + E)$ (j) ED^t

[10] 2. Find the matrix S such that $SM + S = N$, where

$$M = \begin{bmatrix} 0 & 2 & 3 \\ 1 & 2 & 3 \\ 2 & 4 & 6 \end{bmatrix} \quad \text{and} \quad N = \begin{bmatrix} 2 & 3 & 4 \\ 4 & 2 & 1 \\ 1 & 1 & 3 \end{bmatrix}.$$

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

- (a) Find A^{-1} . Show all your work and verify that your answer is correct.
(b) Use part (a) to solve the system:
$$\begin{aligned} x + 2y &= 3 \\ 2x + z &= 5 \\ x + 2y + 3z &= -2 \end{aligned}$$

- [20] 4. An economy consists of two sectors, electricity and petroleum. The production of \$1 of electricity requires 40 cents in electricity and 10 cents in petroleum, whereas the production of \$1 of petroleum requires 20 cents in electricity and 30 cents in petroleum. If there is an outside demand for \$3200 of electricity and \$2800 of petroleum, find the necessary production of electricity and petroleum.
- [20] 5. Consider an isolated Pacific island community that has no trade with the outside world. The economy of the island consists of three types of industries: fishing, boat building and fruit gathering. Each industry receives contributions from the other industries. The fishermen keep $\frac{2}{5}$ of the fish they catch for themselves and give $\frac{3}{10}$ of their production to the boat building industry and $\frac{3}{10}$ of their production to the fruit gatherers. The boat builders keep $\frac{1}{2}$ of their production for themselves; give $\frac{1}{4}$ of their production to the fishermen and $\frac{1}{4}$ of their production to the fruit gatherers. The fruit gatherers keep $\frac{2}{5}$ of the fruit they gather for themselves, give $\frac{2}{5}$ of their production to the fishermen and $\frac{1}{5}$ of their production to the boat builders. What is a fair way to assign values of the 3 industries of fishing, boat building and fruit gathering?