

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

[15] 1. Consider the following matrices.

$$A = \begin{bmatrix} 1 & 2 & 4 \\ 0 & -3 & 5 \\ 6 & 4 & -1 \end{bmatrix}, \quad B = \begin{bmatrix} 5 & 1 \\ 3 & 2 \\ 4 & 7 \end{bmatrix}, \quad C = \begin{bmatrix} 4 & 1 & -2 \\ 3 & 5 & 6 \end{bmatrix}$$

Calculate, if possible, the following matrix results. If the result does not exist, explain why it does not exist.

(a)  $AB$       (b)  $BA$       (c)  $B + 2C^t$       (d)  $B - C$       (e)  $C(A + I_3)$

[10] 2. Find the matrix  $S$  such that  $SM = N + I_3$  given that  $I_3$  is the  $3 \times 3$  identity matrix and

$$M = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 5 & 1 & 1 \end{bmatrix} \quad \text{and} \quad N = \begin{bmatrix} 2 & 3 & 2 \\ 4 & 1 & 1 \\ 3 & 1 & 5 \end{bmatrix}.$$

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

(a) Find  $A^{-1}$ . Show all your work and verify that your answer is correct.  
(b) Use part (a) to solve the system of linear equations

$$x + 3z = -5$$

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

$$y + z = 5$$

[10] 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.

- [15] 5. Suppose in a primitive society the members of a tribe are engaged in three occupations: farming, manufacturing of tools and utensils and sewing clothes. Assume that initially the tribe has no monetary system and that all the goods and services are bartered. The farmers keep half of their produce and give  $\frac{1}{4}$  of their produce to the manufacturers and  $\frac{1}{4}$  to the clothing producers. The manufacturers divide the goods evenly among the three groups. The group producing clothes gives half of the clothes to the farmers and divides the other half evenly between the manufacturers and themselves. After a while the tribe decides to institute a monetary system of exchange. For this simple economic system we assume that there will be no accumulation of capital or debt and that the prices for each of the three types of goods will reflect the values of the existing bartering system. In which way do we assign values to the three types of goods that fairly represents the bartering system?