

Math 251 X02 Assignment One

Name: \_\_\_\_\_

**Due: In class on Tuesday July 19**

Assignments must be completed on this paper. Marks may be deducted for not showing all your work.

1. [4 marks] Find the area of the triangle with vertices  $(1, 4, 1)$ ,  $(2, -1, 6)$  and  $(3, -2, 4)$ .

2. [3 marks] Find the vector form of the plane  $5x + 2y - 4z = 10$ .

3. [4 marks] Line  $\mathcal{L}$  is given by  $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 5 \\ 6 \end{bmatrix} + t \begin{bmatrix} -3 \\ 0 \\ 4 \end{bmatrix}$ . Find the point  $R$  on  $\mathcal{L}$  that is closest to  $Q = (2, 1, 9)$ .

4. [3 marks] Find the point of intersection of the lines given by

$$\mathbf{x} = \begin{bmatrix} 1 \\ -6 \\ 5 \end{bmatrix} + s \begin{bmatrix} -1 \\ 1 \\ 4 \end{bmatrix} \text{ and } \mathbf{x} = \begin{bmatrix} 3 \\ -2 \\ 3 \end{bmatrix} + t \begin{bmatrix} -4 \\ 1 \\ 13 \end{bmatrix}, \text{ or show that there is}$$

no intersection.

5. [4 marks] Solve using either Gaussian or Gauss-Jordan Elimination.

$$a + b + c + d = 4$$

$$a + 2b + 3c + d = 14$$

$$2a + 2b + 3c + 3d = 9$$

$$7a + 8b + 10c + 8d = 39$$

6. [3 marks] Show that the span of  $\begin{bmatrix} -1 \\ 3 \end{bmatrix}$  and  $\begin{bmatrix} -4 \\ 15 \end{bmatrix}$  is all of  $\mathcal{R}^2$ .

7. [4 marks] Write one of the vectors below as a linear combination of the other two:

$$\mathbf{v}_1 = \begin{bmatrix} 1 \\ 3 \\ 10 \end{bmatrix}, \mathbf{v}_2 = \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}, \mathbf{v}_3 = \begin{bmatrix} -1 \\ 2 \\ 5 \end{bmatrix}.$$