Answer the following questions:

Q1:

1- **a**, **b**, **c**, and **d** are vectors, $\mathbf{d} = [\mathbf{a}^T\ \mathbf{b}^T\ \mathbf{c}^T]^T$. If $\|\mathbf{d}\|$=6.08, $\|\mathbf{b}\|$=4.12, and $\|\mathbf{c}\|$=3.74, **find** $\|\mathbf{a}\|$.

2- There are 3 vectors $\mathbf{a}$=[1 2 3]^T, $\mathbf{b}$=[4 5 6]^T, and $\mathbf{c}$=[−1 0 1]^T. Find the **nearest** vector to **a**.

3- Find the **angle** between the vectors **a** and **b**, where $\mathbf{a}$=[1 2 0]^T and $\mathbf{b}$=[1 0 −1]^T.

Q2:

1- The table below represents 5 persons' weight and corresponding blood pressure. Find the **correlation type** between weight and blood pressure.

Weight (x)	74	96	85	91	100
Blood pressure (y)	125	140	130	135	147

2- **Find** the value of x, if the vectors $\mathbf{a}$=[1 2 2 3]^T and $\mathbf{b}$=[x 1 −1 1]^T are **orthogonal**.

Q3:

1- **Normalize** the vector $\mathbf{a}$=[0 10 20 30]^T.

2- **Check** if the vectors $\mathbf{a}$=[1 1]^T and $\mathbf{b}$=[1 −1]^T are **basis**. If they are a basis, **expand** the vector b=[5 −1]^T in this basis.

Q4:

1- **Solve** the following equations by achieving a **reduced Echelon form**.

$$x_1 + 2x_2 - x_3 = 6$$
$$3x_1 + 8x_2 + 9x_3 = 10$$
$$2x_1 - x_2 + 2x_3 = -2$$

2- **Transform** the following augmented matrices into **Echelon form**, then find the solution if there is one.

a-
$$\begin{bmatrix} 1 & 2 & -5 & 0 \\ 1 & 3 & -8 & -2 \\ 0 & -3 & 9 & 5 \end{bmatrix}$$

b-
$$\begin{bmatrix} 1 & -2 & 1 & 0 \\ 0 & 5 & -2 & 8 \\ 1 & 3 & -1 & 8 \end{bmatrix}$$

Good Luck