

Instructions

- Answer each question completely; justify your answers.
- This assignment is due at 17:00 on Wednesday October 17th in Assignment Box #42.

1. Let π be the plane spanned by the vectors $u = \begin{bmatrix} -1 \\ 4 \\ 2 \end{bmatrix}$ and $v = \begin{bmatrix} -3 \\ 1 \\ 7 \end{bmatrix}$.

- Find $p = \text{proj}_V u$.
- Find $q = \text{proj}_U v$.
- Find two orthogonal vectors in π .

2. Consider the point $P(2, 3, 6)$ and the plane π with equation $2x - 12y + 3z = 6$.
Find the distance from P to π .

3. Consider the point $Q(0, 2, 10)$ and the line λ with equation $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ 3 \\ -5 \end{bmatrix} + t \begin{bmatrix} 1 \\ -2 \\ 4 \end{bmatrix}$.

- Find the distance from Q to λ .
- Find the point on λ that is closest to Q .

4. Consider the vector $v = \begin{bmatrix} 2 \\ -4 \\ 8 \end{bmatrix}$ and the plane π with equation $2x + y - 3z = 0$.

Find $\text{proj}_\pi v$.

5. Consider the vectors $v_1 = \begin{bmatrix} 7 \\ 2 \\ 8 \end{bmatrix}$, $v_2 = \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix}$ and $v_3 = \begin{bmatrix} 1 \\ 0 \\ 4 \end{bmatrix}$.

Determine whether these vectors are linearly independent or linearly dependent.

6. Consider the vectors $v_1 = \begin{bmatrix} 4 \\ 2 \\ -2 \end{bmatrix}$, $v_2 = \begin{bmatrix} 4 \\ -6 \\ 6 \end{bmatrix}$ and $v_3 = \begin{bmatrix} 2 \\ 3 \\ -3 \end{bmatrix}$.

Determine whether these vectors are linearly independent or linearly dependent.

7. Consider the vectors $v_1 = \begin{bmatrix} 0 \\ 2 \\ 4 \\ 0 \end{bmatrix}$, $v_2 = \begin{bmatrix} -2 \\ 1 \\ 3 \\ 1 \end{bmatrix}$, $v_3 = \begin{bmatrix} 1 \\ 0 \\ 4 \\ 2 \end{bmatrix}$ and $v_4 = \begin{bmatrix} 1 \\ 2 \\ 0 \\ -1 \end{bmatrix}$.

Determine whether these vectors are linearly independent or linearly dependent.