

MATH 1210 Problem Workshop 11

1. Determine whether the given vectors are linearly independent or linearly dependent.

(a) $\mathbf{u} = \langle 2, 1, -3, 0 \rangle$, $\mathbf{v} = \langle 5, -1, 2, 3 \rangle$, $\mathbf{w} = \langle 0, 3, 2, -4 \rangle$.

(b) $\mathbf{u} = \langle 3, 2, -1 \rangle$, $\mathbf{v} = \langle -4, 2, 6 \rangle$, $\mathbf{w} = \langle 5, -1, 2 \rangle$.

(c) $\mathbf{u} = \langle 3, 2 \rangle$, $\mathbf{v} = \langle 5, -1 \rangle$, $\mathbf{w} = \langle 6, -23 \rangle$.

2. Show that the following vectors are linearly dependent and express one vector as a linear combination of the other two vectors.

$$\mathbf{u} = \langle 2, 1, -3, 0 \rangle, \quad \mathbf{v} = \langle 5, -1, 2, 3 \rangle, \quad \mathbf{w} = \langle 0, -7, 19, 6 \rangle$$

3. Find the inverse of the following matrices if they exist. If they don't exist, give a reason.

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

Answers

1. (a) Independent, (b) Independent, (c) Dependent

2. $\mathbf{u} = \frac{2}{5}\mathbf{v} - \frac{1}{5}\mathbf{w}$

3.

$$B^{-1} = \begin{bmatrix} 1/4 & 3/8 \\ 1/4 & -1/8 \end{bmatrix}, C^{-1} \text{ does not exist ,}$$

$$D^{-1} = \begin{bmatrix} 1 & 0 & -1 \\ -1 & 1 & 1 \\ 1/2 & -1/2 & 0 \end{bmatrix}, E^{-1} = \begin{bmatrix} -1/2 & 0 & 1/2 \\ 2 & -2 & 1 \\ -1/2 & 1 & -1/2 \end{bmatrix}$$