

## Practical 1

**Problem 1.** Determine whether the following vectors are linearly independent:

$$(i) \mathbf{u} = \begin{bmatrix} 3 \\ 1 \end{bmatrix}, \mathbf{v} = \begin{bmatrix} 0 \\ -1 \end{bmatrix}, (ii) \mathbf{u} = \begin{bmatrix} 2 \\ -1 \end{bmatrix}, \mathbf{v} = \begin{bmatrix} -1 \\ -1 \end{bmatrix}$$

**Problem 2.** Find a value for  $x$  so that the following vectors:

$$\mathbf{u} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \mathbf{v} = \begin{bmatrix} 1 \\ x \end{bmatrix}$$

are:

- (i) linearly dependent.
- (ii) linearly independent.

**Problem 3.** Find two nontrivial vectors (other than  $\mathbf{e}_1, \mathbf{e}_2$ ) that span the plane.

**Problem 4.** Show that the vectors:

$$\mathbf{u} = \begin{bmatrix} -1 \\ 1 \end{bmatrix}, \mathbf{v} = \begin{bmatrix} 1/3 \\ -1/3 \end{bmatrix}$$

are linearly dependent.

**Problem 5.** Determine whether the vector  $\mathbf{u} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$  is a linear combination of:

$$\mathbf{v} = \begin{bmatrix} 0 \\ 2 \end{bmatrix}, \mathbf{w} = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$

If yes, find the scalars.