

## Problems for Tutorials: Week 21

**Problem 1.** Using Gauss–Jordan elimination:

- (i) Determine whether the vector  $\mathbf{u} = \begin{bmatrix} 9 \\ 0 \\ 4 \end{bmatrix}$  belongs to the span of the following vectors:

$$\mathbf{v} = \begin{bmatrix} 1 \\ 2 \\ 4 \end{bmatrix}, \mathbf{w} = \begin{bmatrix} 2 \\ -1 \\ -1 \end{bmatrix}, \mathbf{z} = \begin{bmatrix} -3 \\ 1 \\ 1 \end{bmatrix}$$

- (ii) Show that the vectors

$$\mathbf{u} = \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix}, \mathbf{v} = \begin{bmatrix} -3 \\ 2 \\ 4 \end{bmatrix}, \mathbf{w} = \begin{bmatrix} -2 \\ 1 \\ 6 \end{bmatrix}$$

are linearly dependent and simplify  $\text{span}(\mathbf{u}, \mathbf{v}, \mathbf{w})$  in terms of  $\mathbf{u}, \mathbf{v}, \mathbf{w}$ .

**Problem 2.** For what  $k$  values will the systems:

$$(a) \quad \begin{cases} kx + 2y = 3 \\ 2x - 4y = -6 \end{cases}, \quad (b) \quad \begin{cases} x + ky = 1 \\ kx + y = 1 \end{cases}$$

have: (i) infinitely many solutions,

(ii) no solutions and

(iii) a unique solution

For (i) write the set of solutions.