October 14, 2019 Lecturer Dmitri Zaitsev

MAU22E01 2019 (SF Engineers & MSISS & MEMS)

S h e e t 5

Due: at the end of the tutorial

Exercise 1

In each case, either find the coordinates of the vector $\mathbf{v}$ with respect to the basis $\mathbf{v}_1, \ldots, \mathbf{v}_n$ of their span (i.e. the coefficients $k_1, \ldots, k_n$ in the representation $\mathbf{v} = k_1\mathbf{v}_1 + \cdots + k_n\mathbf{v}_n$) or conclude that $\mathbf{v}$ is not in the span of $\mathbf{v}_1, \ldots, \mathbf{v}_n$:

(i) $\mathbf{v} = (1, 1)$, $\mathbf{v}_1 = (1, -1)$, $\mathbf{v}_2 = (1, -2)$;

(ii) $\mathbf{v} = (1, -3, 2)$, $\mathbf{v}_1 = (-1, -1, 0)$, $\mathbf{v}_2 = (1, 0, 1)$, $\mathbf{v}_3 = (0, 1, 1)$;

(iii) $\mathbf{v} = (-1, 1, 1, 1)$, $\mathbf{v}_1 = (1, 0, 1, 0)$, $\mathbf{v}_2 = (1, 1, 0, 0)$, $\mathbf{v}_3 = (0, 0, 2, 0)$.

(iv) $\mathbf{v} = (1, 1, 1, 0)$, $\mathbf{v}_1 = (1, 0, 1, 0)$, $\mathbf{v}_2 = (1, 1, 0, 0)$, $\mathbf{v}_3 = (0, 0, 2, 0)$, $\mathbf{v}_4 = (1, 0, 0, -1)$.

Exercise 2

Separate variables into two groups of dependent and free variables, write the general solution of the system and find a particular solution:

(i)

$$\begin{cases} x + y - t = 1 \\ -z + 2t = -3 \end{cases};$$

(ii)

$$\begin{cases} x_4 - x_3 = -1 \\ x_3 - x_1 = 1 \\ x_2 - x_1 = 1 \end{cases};$$

(iii)

$$x_1 - x_2 + x_3 - x_4 + x_5 = 1.$$