**Course 2E2 2008-09 (SF Engineers & MSISS & MEMS)**

S h e e t   5

Due: at the end of the tutorial

## Exercise 1

Which of the following sets of vectors are bases for the corresponding space $\mathbb{R}^n$? (The dimension $n$ should be clear from the length of vectors.)

(i) $(1, 1)$;

(ii) $(0, 1)$, $(1, -1)$;

(iii) $(2, 2)$, $(1, 1)$;

(iv) $(-2, 2)$, $(2, 2)$, $(1, 1)$;

(v) $(1, 0, 0, 0)$, $(0, 1, -2, 3)$, $(-1, 3, 2, 1)$;

(vi) $(-1, 0, 1)$, $(0, 3, 0)$, $(1, -1, -1)$.

## Exercise 2

Find the coordinates of the vector $\mathbf{v}$ with respect to the basis $\mathbf{v}_1, \ldots, \mathbf{v}_n$ (i.e. the coefficients $k_1, \ldots, k_n$ in the representation $\mathbf{v} = k_1\mathbf{v}_1 + \cdots + k_n\mathbf{v}_n$:

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

(ii) $\mathbf{v} = (2, -1, 4)$, $\mathbf{v}_1 = (-1, 1, 0)$, $\mathbf{v}_2 = (1, 1, 0)$, $\mathbf{v}_3 = (1, -1, 1)$;

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