Exercise 1
Which of the following sets of vectors are linearly dependent?
(i) $(0,1), (1,-2)$;
(ii) $(0,1,1), (1,-1,0), (-2,0,-2)$;
(iii) $(0,0,1,0,0), (0,2,3,1,1), (0,2,0,0,1)$.

Exercise 2
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) $(-1,2)$;
(ii) $(0,1), (1,2)$;
(iii) $(-1,-1), (3,3)$;
(iv) $(-1,-1), (15,-12), (-1,1)$;
(v) $(1,-1,2,0), (1,1,5,3), (1,3,2,1)$;
(vi) $(1,0,1), (1,1,0), (2,1,0)$.

Exercise 3
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) $\mathbf{v} = (-2,-1)$, $\mathbf{v}_1 = (1,1), \mathbf{v}_2 = (1,2)$;
(ii) $\mathbf{v} = (1,0,1,0)$, $\mathbf{v}_1 = (1,0,1,0), \mathbf{v}_2 = (1,1,0,0), \mathbf{v}_3 = (0,0,1,0), \mathbf{v}_4 = (1,0,0,1)$. 