Exercise 1

Determine which of the following are subspaces of $\mathbb{R}^3$:

(i) the set of all vectors of the form $(-a, a, 0)$;
(ii) the set of all vectors of the form $(1, -1, a)$;
(iii) the set of all vectors of the form $(b, 3b, -a)$.

Exercise 2

Determine whether the vectors span $\mathbb{R}^3$:

(i) $v_1 = (1, -2, 0), v_2 = (2, -1, 0), v_3 = (3, 0, 0)$;
(ii) $v_1 = (1, -2, 0), v_2 = (2, -1, 0), v_3 = (3, 0, 0), v_4 = (1, 0, 1)$.

Determine whether the vectors span $\mathbb{R}^4$:

(iii) $v_1 = (-1, 2, 0, 1), v_2 = (1, 0, 2, 0), v_3 = (2, 0, 0, 0), v_4 = (1, 0, -1, 0)$. 