(1) Consider a subset of $\mathbb{R}^3$ defined by

$$S = \{a = (a_1, 0, a_3) : a_1 + a_3 \geq 0\}.$$  
Is $S$ a subspace? (why?)

(2) Consider the vector space

$$S = \langle u, v, x, y \rangle : u + v + x = 0, y + 2u = v, \quad u, v, x, y \in \mathbb{R} \rangle.$$  
Find a basis and the dimension of $S$. 