Name: ID #: Section #:

**(1)** Determine which of the following sets are ***subspace*** of $\mathbb{R}^3$. Justify your answer.

(a) The set of all vectors of the form $\langle a, 1, 1\rangle$.

(b) $V = \{\langle x, y, z\rangle \mid 2x + y - z = 0\}$.

(c) The set of all vectors of the form $\langle 0, b, 0\rangle$.

(d) The set of all vectors of the form $\langle a, b, c\rangle$, where $a + b + c = 1$.

**(2)** The set $B = \{u_1, u_2, u_3\}$, where $u_1 = \langle 1, 1, 1\rangle$, $u_2 = \langle 0, 1, 1\rangle$ and $u_3 = \langle 0, 0, 1\rangle$ is a ***basis*** for $\mathbb{R}^3$.

(a) Show that $B$ is ***linearly independent***.

(b) Express the vector $\langle 2, -5, 7\rangle$ as a ***linear combination*** of $u_1, u_2, u_3$.

(**3**) Let $V$ be the set of all vectors on the $xz$-plane (in $\mathbb{R}^3$). Show that the set $\{u_1, u_2\}$, where $u_1 = \langle 1, 0, 1\rangle,\ u_2 = \langle 1, 0, 0\rangle$ ***spans*** the vector space $V$. What is the ***dimension*** of $V$? (Justify your answer)