PRINT Your Name:___________________________________

Quiz for September 20, 2005

Let U and V be the following subspaces of $\mathbb{R}^3$:

$$U = \left\{ \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \middle| \; x_1 + x_2 = 0 \right\}$$

and

$$V = \left\{ \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \middle| \; x_2 - x_3 = 0 \right\}.$$

Is the union $U \cup V$ a subspace of $\mathbb{R}^3$? Prove your answer.

ANSWER: NO. The union $U \cup V$ is NOT closed under addition. The vector $v_1 = \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}$ is in $U \cup V$ because $v_1 \in U$. The vector $v_2 = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$ is in $U \cup V$ because $v_2 \in V$. However, the sum $v_1 + v_2 = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$ is not in $U \cup V$ since $v_1 + v_2 \notin U$ and $v_1 + v_2 \notin V$.