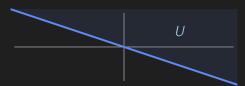1. Consider the set of all points in the region U shown in $\mathbb{R}^2$ below. Assume the set includes the boundary line. Give a specific reason why the set U is *not* a subspace of $\mathbb{R}^2$.

2. Let W be the set of all points on either the $x-$ or $y-$ axis. That is, W is all the points of the form $\begin{bmatrix} a \\ 0 \end{bmatrix}$ or $\begin{bmatrix} 0 \\ b \end{bmatrix}$ for any real numbers a and b. Show that W is not a subspace.

3. Consider A and its reduced row echelon form below.

$$A = \begin{bmatrix} -3 & 9 & -2 & -7 \\ 2 & -6 & 4 & 8 \\ 3 & -9 & -2 & 2 \end{bmatrix} \rightarrow \underbrace{\begin{bmatrix} 1 & -3 & 0 & 3/2 \\ 0 & 0 & 1 & 5/4 \\ 0 & 0 & 0 & 0 \end{bmatrix}}_{\text{rref of } A}$$

Let b_1, b_2, b_3, and b_4 be the columns of rref(A). Note that

$$-3b_1 = b_2 \quad \text{and} \quad \frac{3}{2}b_1 + \frac{5}{4}b_3 = b_4$$

Now let a_1, a_2, a_3, and a_4 be the columns of A.

(a) Show that $-3a_1 = a_3$.

(b) Find a linear combination of a_4 in terms of a_1 and a_3.

(c) Show that the set $\{a_1, a_2, a_3, a_4\}$ is linearly dependent.