Math 320, Linear Algebra I, Quiz 3, February 6, 2013, Instructor: S. Friedland
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Show all work. **Unjustified** answer yields no credit.

1. (2 pts) Let $\mathbf{V}$ be a vector space and U a subset of $\mathbf{V}$. What are the conditions for U to be a subspace of $\mathbf{V}$?

2. Determine if the following subsets U of $\mathbb{R}^3$ are subspaces. **Justify!**
   a. (4pts) U consists of all vectors $\mathbf{x} = (x_1, x_2, x_3)^\top$ satisfying $4x_1 - x_2 + x_3 = 0$. (I)
   b. (4 pts) U consists of all vectors $\mathbf{x} = (x_1, x_2, x_3)^\top$ satisfying $4x_1^2 - x_2^2 + x_3^2 = 0$.

1. (i) if $x, y \in U$ then $x+y \in U$ 1p
(ii) if $x \in U$ then $ax \in U$ 1p

2a suppose $x=(x_1,x_2,x_3)^T$ and $y(y_1,y_2,y_3)^T$ satisfy the equation (I)

Then $4(x_1+y_1) - (x_2+y_2) + (x_3+y_3) = 0 \Rightarrow x+y \in U$ 2p

clearly $4(ax_1) - (ax_2) + ax_3 = 0$ then $ax \in U$ 2p

So U is a subspace

2(b) Take $x = (1,2,0)^T$ 1p and $y = (0,1,1)^T$ 1p

Both in U. But $x+y = (1,3,1) \notin U$ as

$4 \cdot 1^2 - 3^2 + 1^2 = 4-9+1 = -4 \neq 0$ 2p

U not a subspace.