

You must show all your work to receive credit. Calculators are allowed.

Problem 1: (3 points) For each of the following problems, V is a vector space and W is a subset of V . Determine whether or not W is a *subspace* of V , and explain why or why not.

a) $V = \mathbb{R}^2$, W is the line given by the equation $y = 2x + 1$.

No, W does not contain $\vec{0}$

b) $V = P$ (the set of all polynomials), and $W = \{f \in V \mid f(5) = 0\}$.

Yes: If $f, g \in W$, then $(f+g)(5) = f(5) + g(5) = 0$, so $f+g \in W$
and if $c \in \mathbb{R}$, $f \in W$ then $(cf)(5) = cf(5) = 0$, so $cf \in W$.

c) $V = \mathbb{R}^n$ and $W = \left\{ \begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix} \mid x_1, \dots, x_n \geq 0 \right\}$.

~~Yes~~ No: $\begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix} \in W$, but $-1 \cdot \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix} = \begin{bmatrix} -1 \\ \vdots \\ -1 \end{bmatrix} \notin W$