Linear Algebra: Week 4 Notes and Exercises

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1 Notes

Notes

Vector Space
1) $\vec{0} \in V$
2) $\vec{u}, \vec{v} \in V$ then must have $\vec{u} + \vec{v} \in V$
3) $c \in \mathbb{R}, \vec{u} \in V$ then must have $c\vec{u} \in V$
Exercise

2) a) True because scaling $\vec{u}$ with either a positive or negative value will still be in W.
$\vec{u} = \begin{bmatrix} x_1 \\ y_1 \end{bmatrix}, x_1 \geq 0, y_1 \geq 0$
$c \begin{bmatrix} x_1 \\ y_1 \end{bmatrix} = \begin{bmatrix} cx_1 \\ cy_1 \end{bmatrix}$
$c \geq 0 \Rightarrow cx_1 \geq 0 \Rightarrow cy_1 \geq 0$
$c \leq 0 \Rightarrow cx_1 \leq 0 \Rightarrow cy_1 \leq 0$
b)Let $\vec{u} = \begin{bmatrix} 4 \\ 2 \end{bmatrix}, \vec{v} = \begin{bmatrix} -1 \\ -8 \end{bmatrix} \therefore \vec{u} + \vec{v} = \begin{bmatrix} 3 \\ -6 \end{bmatrix}$ which is not in any of the quadrants associated with $W \therefore W$ is not a vector space .

6) $p(t) = a + t^2$
$V = \begin{bmatrix} x_1 & x_2 & x_3 \end{bmatrix} \in \mathbb{R}^3 | x_1 \in \mathbb{R}, x_2 = 0, x_3 = 1$
$\begin{bmatrix} a & 0 & 1 \end{bmatrix}$ Its not a vector space because scaling or adding vectors will change the x_3.