Consider $S = \left\{ \begin{bmatrix} a \\ b \\ a+b \end{bmatrix} \in \mathbb{R}^3 \right\}$

a) Give a few vectors in S. $\begin{bmatrix} 2 \\ 3 \\ 5 \end{bmatrix}, \begin{bmatrix} 4 \\ 9 \\ 13 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

b) Is S closed under addition?

c) " " " " scalar multiplication?

$$\begin{bmatrix} a \\ b \\ a+b \end{bmatrix}, \begin{bmatrix} c \\ d \\ c+d \end{bmatrix} \in S$$

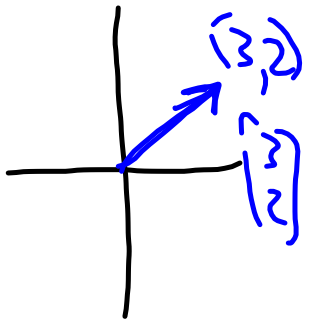
$$\begin{bmatrix} a \\ b \\ a+b \end{bmatrix} + \begin{bmatrix} c \\ d \\ c+d \end{bmatrix} = \begin{bmatrix} a+c \\ b+d \\ a+b+c+d \end{bmatrix} = \begin{bmatrix} a+c \\ b+d \\ (a+c)+(b+d) \end{bmatrix} \in S$$

Therefore S is closed under addition.

$$S_1 = \left\{ t\begin{bmatrix} 1 \\ -2 \end{bmatrix} \mid t \in \mathbb{R} \right\} = \left\{ \begin{bmatrix} 1 \\ -2 \end{bmatrix}, \begin{bmatrix} 3 \\ -6 \end{bmatrix}, \begin{bmatrix} -5 \\ 10 \end{bmatrix}, \ldots \right\}$$

$t=1 \quad t=3 \quad t=-5$

$$S_1 = \left\{ \begin{bmatrix} 0 \\ 0 \end{bmatrix} + t\begin{bmatrix} 1 \\ -2 \end{bmatrix} \mid t \in \mathbb{R} \right\}$$



$$\begin{bmatrix} 3 \\ -6 \end{bmatrix} + \begin{bmatrix} -5 \\ 10 \end{bmatrix} = \begin{bmatrix} -2 \\ 4 \end{bmatrix} = -2 \begin{bmatrix} 1 \\ -2 \end{bmatrix} \in S_1$$

$$\begin{bmatrix} 1 \\ -2 \end{bmatrix} + \begin{bmatrix} 3 \\ -6 \end{bmatrix} = \begin{bmatrix} 4 \\ -8 \end{bmatrix} = 4 \begin{bmatrix} 1 \\ -2 \end{bmatrix} \in S^1$$

$$\pi \begin{bmatrix} -5 \\ 10 \end{bmatrix} = \begin{bmatrix} -5\pi \\ 10\pi \end{bmatrix} \stackrel{?}{=} -5\pi \begin{bmatrix} 1 \\ -2 \end{bmatrix}$$

$$S_2 = \left\{ \begin{bmatrix} 3 \\ 1 \end{bmatrix} + t \begin{bmatrix} 1 \\ -2 \end{bmatrix} \middle| \, t \in \mathbb{R} \right\}$$

$$= \left\{ \begin{bmatrix} 5 \\ -3 \end{bmatrix}, \begin{bmatrix} 6 \\ -5 \end{bmatrix}, \begin{bmatrix} 7 \\ -7 \end{bmatrix}, \begin{bmatrix} 3 \\ 1 \end{bmatrix}, \cdots \right\}$$

$$\begin{bmatrix} 13 \\ -12 \end{bmatrix} = \begin{bmatrix} 3 \\ 1 \end{bmatrix} + \begin{bmatrix} 10 \\ -13 \end{bmatrix} \stackrel{?}{=} \begin{bmatrix} 3 \\ 1 \end{bmatrix} + 10 \begin{bmatrix} 1 \\ -2 \end{bmatrix}$$

$$S_{P_3}' = \left\{ s\begin{bmatrix} 3 \\ 1 \end{bmatrix} + t\begin{bmatrix} 1 \\ -2 \end{bmatrix} \right\}$$

linear combination

$$\begin{bmatrix} 248\pi \\ e-1 \end{bmatrix}$$

$$\begin{bmatrix} \cdot \\ \cdot \end{bmatrix} + s\begin{bmatrix} \cdot \\ \cdot \end{bmatrix} + t\begin{bmatrix} \cdot \\ \cdot \end{bmatrix}$$

$$s\begin{bmatrix}3\\1\end{bmatrix}+t\begin{bmatrix}1\\-2\end{bmatrix}=\begin{bmatrix}3\\-7\end{bmatrix}$$

yours

$s = -0.143$

$t = 3.43$