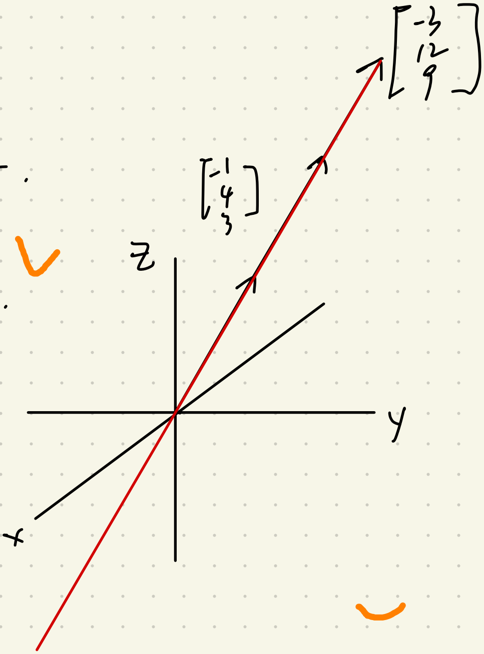
1. a) $\begin{bmatrix}-1\\4\\3\end{bmatrix} \times 3 = \begin{bmatrix}-3\\12\\9\end{bmatrix}$

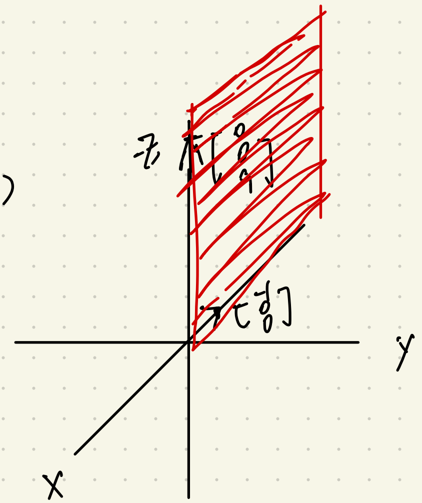
∴ these 2 vectors are collinear.

∴ any linear combination of these vectors follow this line.



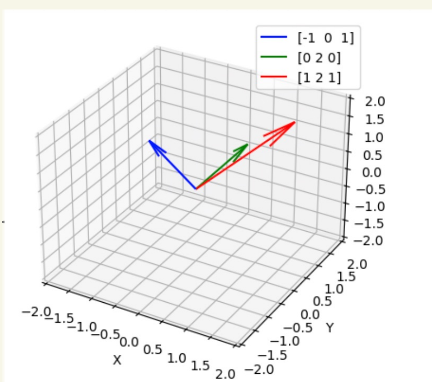
b)

2



∴ They're coplanar. Namely all combinations form a plane of x-z with $y=0$

c)

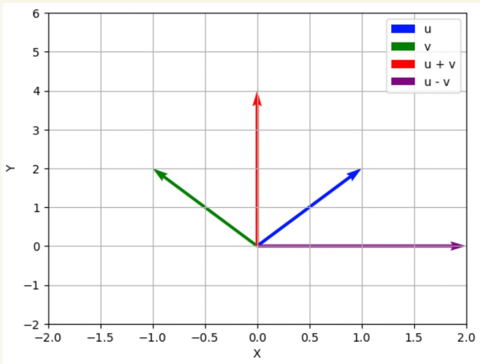


∴ These 3 are either collinear or coplanar. They form a 3D space unrestricted by any specific direction or plane. Any point in this space is a valid combination.

2. a) $u+v = \begin{bmatrix}1\\2\end{bmatrix} + \begin{bmatrix}-1\\2\end{bmatrix} = \begin{bmatrix}1+(-1)\\2+2\end{bmatrix} = \begin{bmatrix}0\\4\end{bmatrix}$

$u-v = \begin{bmatrix}1-(-1)\\2-2\end{bmatrix} = \begin{bmatrix}2\\0\end{bmatrix}$

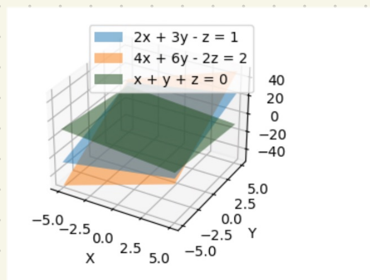
b)



4

3) infinite

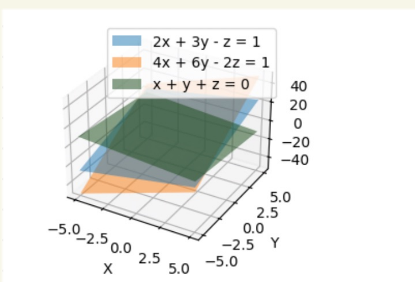
$\begin{bmatrix}2\\4\\1\end{bmatrix}x + \begin{bmatrix}3\\6\\1\end{bmatrix}y + \begin{bmatrix}-1\\-2\\1\end{bmatrix}z = \begin{bmatrix}1\\2\\0\end{bmatrix}$



2

4). infinite

$\begin{bmatrix}2\\4\\1\end{bmatrix}x + \begin{bmatrix}3\\6\\1\end{bmatrix}y + \begin{bmatrix}-1\\-2\\1\end{bmatrix}z = \begin{bmatrix}1\\1\\0\end{bmatrix}$



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