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21/479067/TK/52800

Tugas 1 TVM

1.1 page 8

1. Describe geometrically (line, plane, or all of R^3)

a. $\begin{bmatrix}1\\2\\3\end{bmatrix}$ and $\begin{bmatrix}3\\6\\9\end{bmatrix}$ → line in R^3

b. $\begin{bmatrix}1\\0\\0\end{bmatrix}$ and $\begin{bmatrix}0\\2\\3\end{bmatrix}$ → plane in R^3

c. $\begin{bmatrix}2\\8\end{bmatrix}$, $\begin{bmatrix}0\\2\\2\end{bmatrix}$, $\begin{bmatrix}2\\2\\3\end{bmatrix}$ → all of R^3

5. compute $u + v + w$ and $2u + 2v + w$. How do you know u, v, w lie in a plane?

$u = \begin{bmatrix}1\\2\\3\end{bmatrix}$, $v = \begin{bmatrix}-3\\1\\-2\end{bmatrix}$, $w = \begin{bmatrix}2\\-3\\-1\end{bmatrix}$

$u + v + w = \begin{bmatrix}1\\2\\3\end{bmatrix} + \begin{bmatrix}-3\\1\\-2\end{bmatrix} + \begin{bmatrix}2\\-3\\-1\end{bmatrix} = \begin{bmatrix}0\\0\\0\end{bmatrix}$

$2u + 2v + w = 2\begin{bmatrix}1\\2\\3\end{bmatrix} + 2\begin{bmatrix}-3\\1\\-2\end{bmatrix} + \begin{bmatrix}2\\-3\\-1\end{bmatrix}$

$= \begin{bmatrix}2\\4\\6\end{bmatrix} + \begin{bmatrix}-6\\2\\-4\end{bmatrix} + \begin{bmatrix}2\\-3\\-1\end{bmatrix}$

$= \begin{bmatrix}-2\\3\\1\end{bmatrix}$

u, v, w in a plane because $u + v + w = \begin{bmatrix}0\\0\\0\end{bmatrix}$
and also $u = (-v) + (-w)$

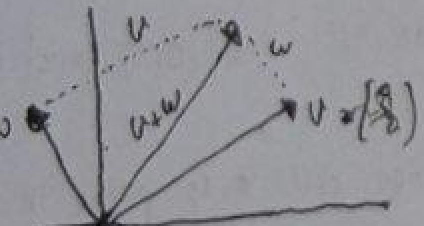
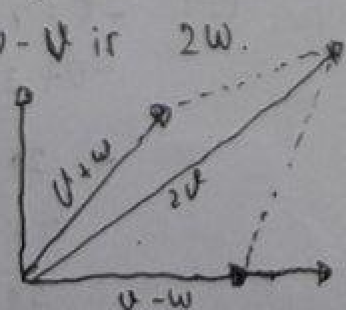
8. 

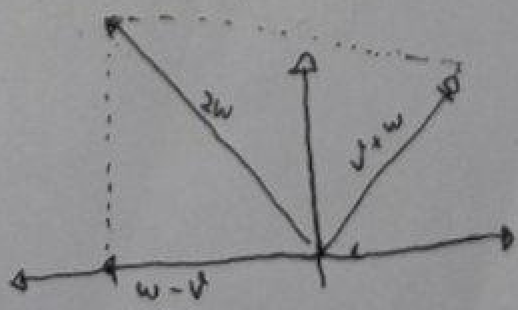
Fig. 1.1

The parallelogram in figure 1.1 has diagonal $v + w$. What is its other diagonal? what is the sum of the ~~other~~ two diagonal? Draw the vector sum.

* Also stated in fig. 1.1, the other diagonal is $v - w$ or it can be $w - v$.
* the sum of $v + w$ and $v - w$ is $2v$ or sum of $v + w$ and $w - v$ is $2w$.

* 

or

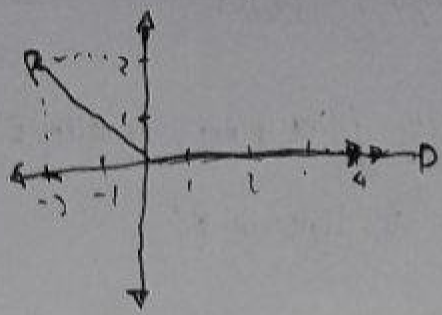


9. three corner of a parallelogram are (1,1), (4,2), (1,3) what are all three of the fourth possible corners? Draw two of them

$*$ $(1,1) + (4,2) - (1,3) = (4,0)$

$*$ $(1,1) + (1,3) - (4,2) = (-2,2)$

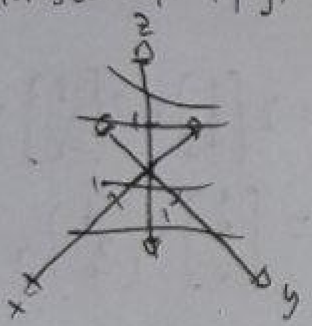
$*$ $(4,2) + (1,3) - (1,1) = (4,4)$

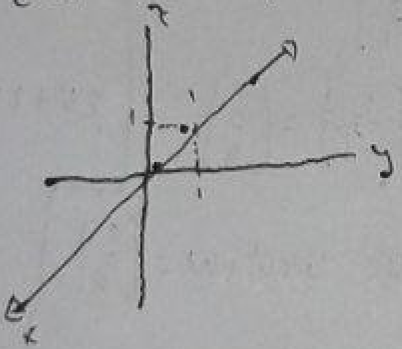


10. Which point of the cube $i+j$? Which point is the ~~sum~~ vector sum of $i = (1,0,0)$ and $j = (0,1,0)$, and $k = (0,0,1)$? Describe all points (x,y,z) in the cube.

$i+j = \begin{bmatrix}1\\0\\0\end{bmatrix} + \begin{bmatrix}0\\1\\0\end{bmatrix} = \begin{bmatrix}1\\1\\0\end{bmatrix}$

vector sum of $i, j, k = \begin{bmatrix}1\\0\\0\end{bmatrix} + \begin{bmatrix}0\\1\\0\end{bmatrix} + \begin{bmatrix}0\\0\\1\end{bmatrix} = \begin{bmatrix}1\\1\\1\end{bmatrix}$





where $0 \le x \le 1$
$0 \le y \le 1$
$0 \le z \le 1$

~~14.~~

27. In xyz space, where is the plane of all linear combination of $i = (1,0,0)$ and ~~i+j~~ $i+j = (1,1,0)$?

When i and i+j isn't perpendicular, their combination fill x,y plane in xyz space.

31. $cu + dv + ew = b$.

$c\begin{bmatrix}2\\-1\\0\end{bmatrix} + d\begin{bmatrix}-1\\2\\-1\end{bmatrix} + e\begin{bmatrix}0\\-1\\2\end{bmatrix} = \begin{bmatrix}1\\0\\0\end{bmatrix} \Leftrightarrow \begin{cases} 2c - d = 1 \\ -c + 2d - e = 0 \\ -d + 2e = 0 \end{cases}$

$2c - d = 1$
$2d - c = e$
$2e = d$

$*$ $2e = d$
$2d - c = e$
$4e - c = e$
$c = 3e$

$*$ $2c - d = 1$
$2c - 2e = 1$
$6e - 2e = 1$
$4e = 1$

$\boxed{e = \frac{1}{4} \quad c = \frac{3}{4} \quad d = \frac{1}{2}}$