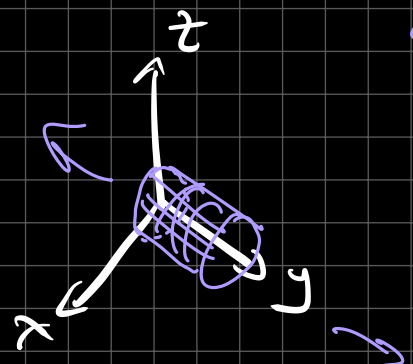
12.1

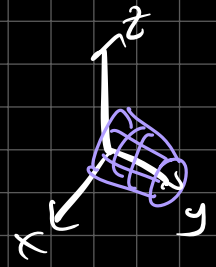
⑧ Describe & sketch $x^2+z^2=9$ in $\mathbb{R}^3$

(x,y,z)

circle of radius = 3 for ALL y



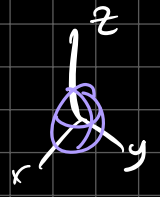
If we knew $0 \le y \le 1$ then



whatif we had $x^2+y^2+z^2=9$ in $\mathbb{R}^3$

Sphere with radius = 3

Center $(0,0,0)$.



⑨ $P(3,-2,-3)$
$Q(7,0,1)$
$R(1,2,1)$

Is this $\triangle PQR$ isosceles & Right.

✓ ✗ does not satisfy $a^2+b^2=c^2$

use $D=\sqrt{(\Delta x)^2+(\Delta y)^2+(\Delta z)^2}$

$$|PQ| = \sqrt{(7-3)^2+(0-(-2))^2+(1-(-3))^2} = 6$$

$|PR| = 6$

$|QR| = \sqrt{40}$

(12) find distance of $(4,-2,6)$ to xz plane.

$(4,0,6)$

$y=0$.

Find distance $= 2$.

(14) find equation of a sphere with center $(2,-6,4)$ and radius $= 5$.

$$(x-2)^2 + (y+6)^2 + (z-4)^2 = 25$$

What is the intersection of ↑ and xy plane? $z=0$

$$(x-2)^2 + (y+6)^2 + \underbrace{(0-4)^2}_{16} = 25$$

$$(x-2)^2 + (y+6)^2 = 9$$ — circle of radius $= 3$

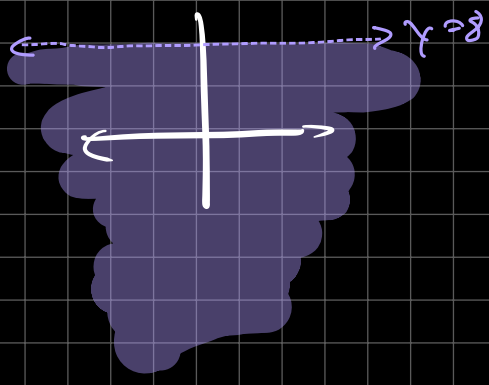
xz plane? $y=0$

$$(x-2)^2 + \underbrace{(0+6)^2}_{36} + (z-4)^2 = 25$$

$$(x-2)^2 + (z-4)^2 = -11$$ no Real solutions!

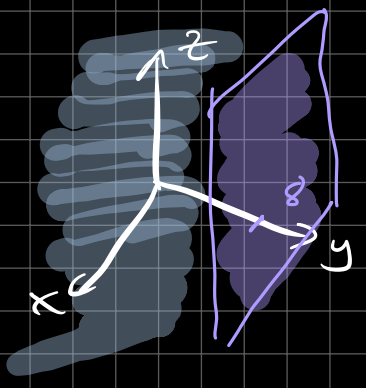
(27) Describe $y < 8$ in

$y \in \mathbb{R}^1$ 

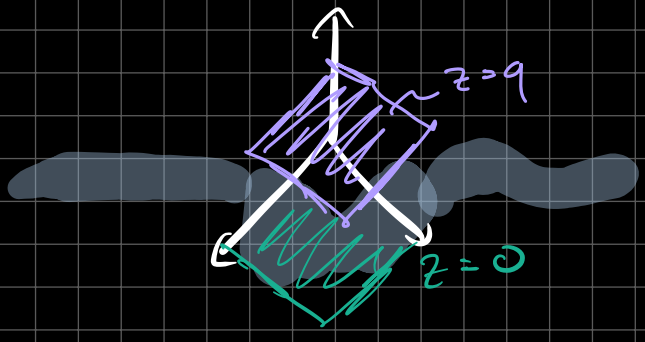
$(x,y) \in \mathbb{R}^2$ 

all points under $y=8$.

$\mathbb{R}^3$ 3 space behind $y=8$ plane.



(29) Describe $0 \le z \le 9$ in $\mathbb{R}^3$



12.2

(3)

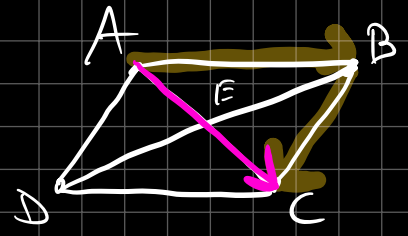
Pairs of equal vectors

$\vec{AD}, \vec{BC}$

$\vec{DA}, \vec{CB}$

$\vec{DE}, \vec{EB}$

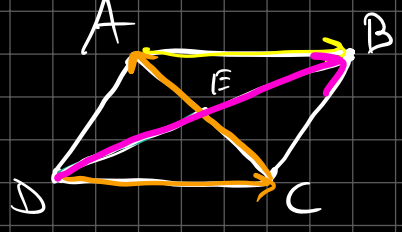
$\vec{AB} + \vec{BC} = \vec{AC}$



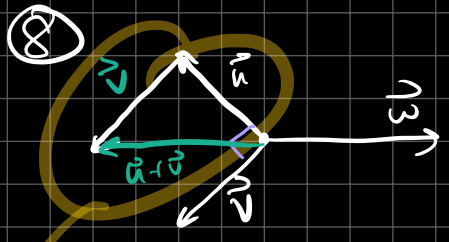
$\vec{DC} + \vec{CA} - \vec{BA}$

$-\vec{BA} = \vec{AB}$

$\vec{DC} + \vec{CA} + \vec{AB} = \vec{DB}$



(8)



$\vec{u} + \vec{v} + \vec{w} = \vec{0}$

$\|\vec{u}\| = \|\vec{v}\| = 1$ → our text uses $|\vec{u}|$

$= \|\vec{u}\|$

$= \sqrt{u_1^2 + u_2^2 + \dots}$

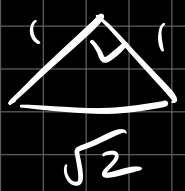
what is $\|\vec{w}\|$?

$\vec{u} + \vec{v} + \vec{w} = \vec{0}$

$-\vec{w} \quad -\vec{w}$

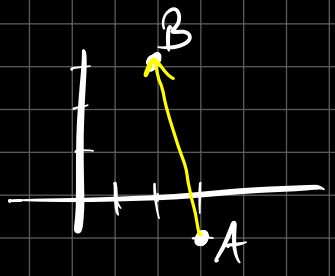
$-\vec{w} = \vec{u} + \vec{v}$

$\|-\vec{w}\| = \|\vec{w}\| = \sqrt{2}.$



(1) $A(3,-1)$ $B(2,3)$

find $\vec{AB}$



$\langle 2-3, 3-(-1)\rangle = \langle -1, 4\rangle$

$$\begin{bmatrix} -1 \\ 4 \end{bmatrix} \quad \text{or} \quad \begin{pmatrix} -1 \\ 4 \end{pmatrix} \quad \text{or} \quad \underbrace{(-1,4)}_{\text{a bit confusing for our course.}}$$

also $\hat{\imath} = \langle 1,0\rangle$

$\hat{\jmath} = \langle 0,1\rangle$

$\boxed{\langle -1,4\rangle = -\hat{\imath} + 4\hat{\jmath}}$ my favs ♡

$\mathbb{R}^3$ $\hat{\imath} = \langle 1,0,0\rangle$

$\hat{\jmath} = \langle 0,1,0\rangle$

$\hat{k} = \langle 0,0,1\rangle$

find the unit vector in the direction of $\underbrace{\langle -1,4\rangle}_{\vec{v}}$

$\|\vec{u}\| = 1$

$$\|\vec{v}\| = \sqrt{(-1)^2 + (4)^2} = \sqrt{17}$$

$$\frac{\vec{v}}{\|\vec{v}\|} = \left\langle -\frac{1}{\sqrt{17}}, \frac{4}{\sqrt{17}} \right\rangle = -\frac{1}{\sqrt{17}}\hat{\imath} + \frac{4}{\sqrt{17}}\hat{\jmath}$$