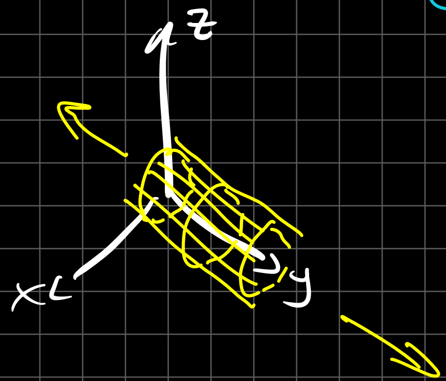
12.1

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

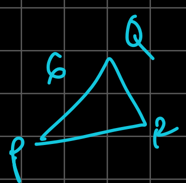
circle in xz plane.
radius = 3
for all y



Cylinder centered about y-axis.

(9) $P(3,2,-3)$
$Q(7,0,1)$
$R(1,2,1)$

Is the Triangle PQR Isosceles? NO!



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

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

$$|PR|=\sqrt{(1-3)^2+(2-2)^2+(1-(-3))^2}=\sqrt{20}$$

$$|QR|=\sqrt{(1-7)^2+(2-0)^2+(1-1)^2}=\sqrt{40}$$

$$6^2+2^2$$

$$36+4$$

Is PQR a right Δ?

Check: $6^2+(\sqrt{20})^2=(\sqrt{40})^2$ **NO**

Not Right Δ

(12) $(4, -2, 6)$

find distance from xz plane.

$y=0$

projection onto xz plane is $(4, 0, 6)$

Distance $= 2$.

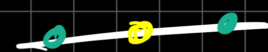
Distance to xy plane $= 6$

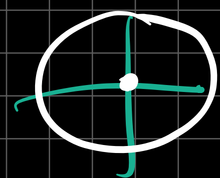
proj onto xy plane $(4, -2, 0)$.

(14) find equation of a sphere with center

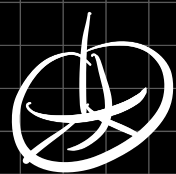
$(2, -6, 4)$

and radius $= 5$.





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



What is the intersection of sphere with xy plane

$z=0$

$$(x-2)^2 + (y+6)^2 + (0-4)^2 = 25$$

$\underbrace{}_{16}$

$(x-2)^2+(y+6)^2=9$

What is intersection with xz plane?
$y=0$

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

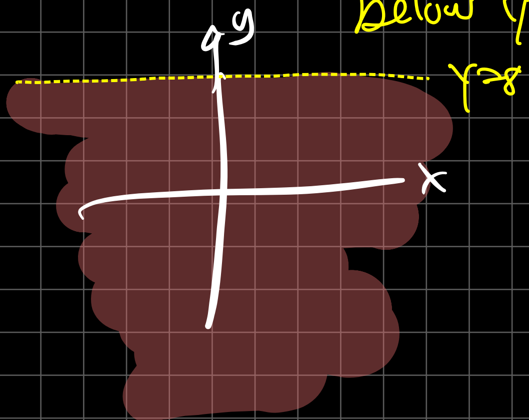
$(x-2)^2+(z-4)^2=-11$ no Real solution.
no int. in $\mathbb{R}^3$.

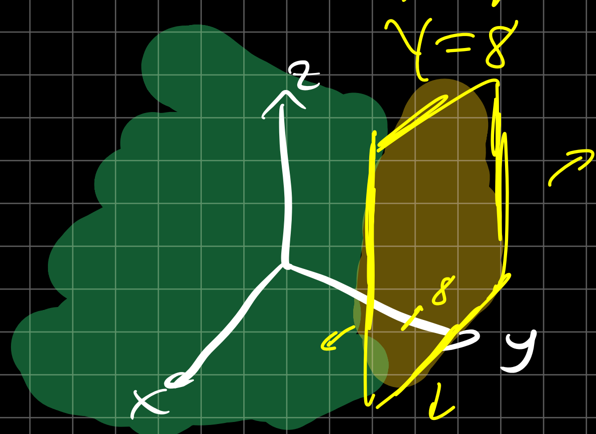
(27) $y<8$

Describe in $\mathbb{R}^2$, $\mathbb{R}^3$

part of plane below $y=8$

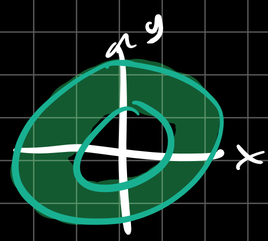
all of 3-space behind the plane $y=8$



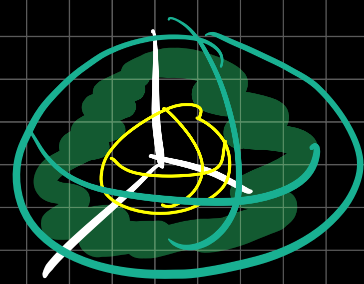


(35) $1\le x^2+y^2\le 5 \longrightarrow 1\le x^2+y^2+z^2\le 5$

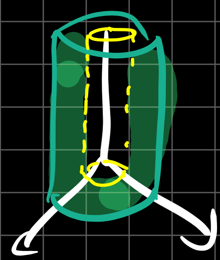
in $\mathbb{R}^2$



in $\mathbb{R}^3$

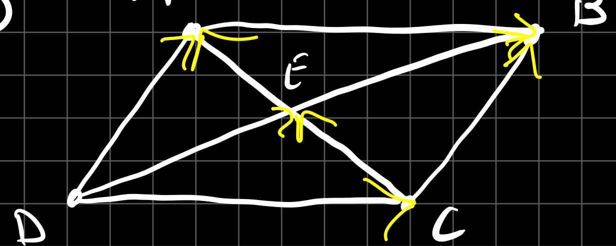


in $\mathbb{R}^3$



12.2

(3)



What are the equivalent vectors?

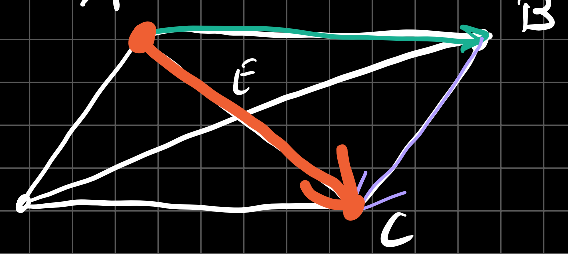
$\vec{DA}$, $\vec{CB}$

$\vec{AB}$, $\vec{DC}$

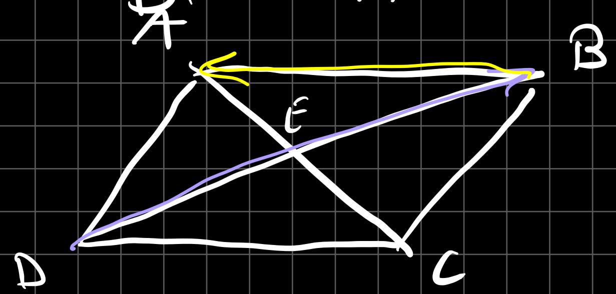
$\vec{AE}$, $\vec{EC}$

⋮

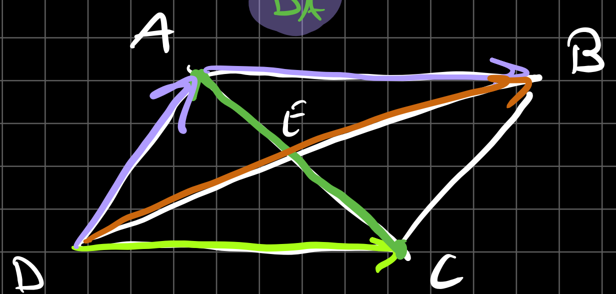
what is $\vec{AB} + \vec{BC} = \vec{AC}$



$$\vec{DB} - \vec{AB} = \vec{DB} + \vec{BA} = \vec{DA}$$



$$\underbrace{\vec{DC} + \vec{CA}}_{\vec{DA}} + \vec{AB} = \vec{DB}$$

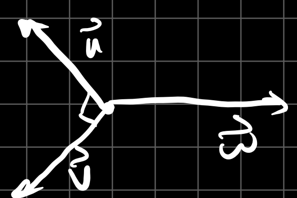


⑧ $\|\vec{u}\| = \|\vec{v}\| = 1$, $\vec{u} + \vec{v} + \vec{w} = \vec{0}$

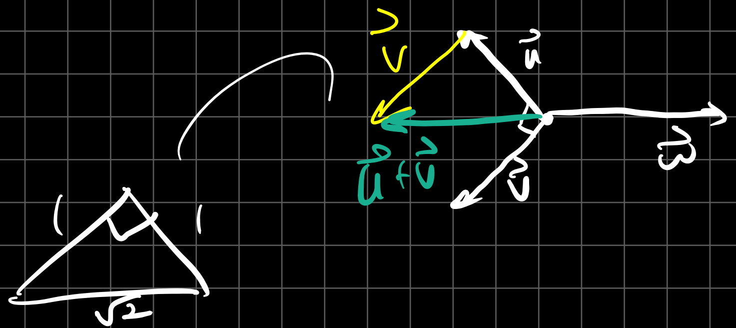
$-\vec{w} \quad -\vec{w}$

Same as: $|\vec{u}|$

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



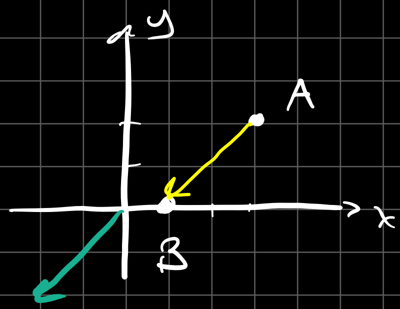
What is $\|\vec{w}\| = \|-\vec{w}\| = \|\vec{u} + \vec{v}\| = \sqrt{2}$



(12) $A(3,2)$ $B(1,0)$

$\hat{i} = \langle 1,0 \rangle$
$\hat{j} = \langle 0,1 \rangle$

find $\vec{AB} = \langle 1-3, 0-2 \rangle = \langle -2, -2 \rangle$
$= -2\hat{i} - 2\hat{j}$



in $\mathbb{R}^3$
$\hat{i} = \langle 1,0,0 \rangle$
$\hat{j} = \langle 0,1,0 \rangle$

$\hat{i} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$

$\underbrace{\hat{i} = (1,0,0)}_{\text{stay away.}}$

now find the unit vector in direction of $\langle -2,-2 \rangle$

$\frac{\vec{u}}{\|\vec{u}\|}$

$\| -2\hat{i} - 2\hat{j} \| = \sqrt{(-2)^2 + (-2)^2}$
$= \sqrt{8} = 2\sqrt{2}$

unit vector: $\frac{\langle -2,-2 \rangle}{2\sqrt{2}} = \frac{-2\hat{i} - 2\hat{j}}{2\sqrt{2}}$

$= \langle -\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}} \rangle = -\frac{1}{\sqrt{2}}\hat{i} - \frac{1}{\sqrt{2}}\hat{j}$