Lyell C Read

CH 11.1 Homework

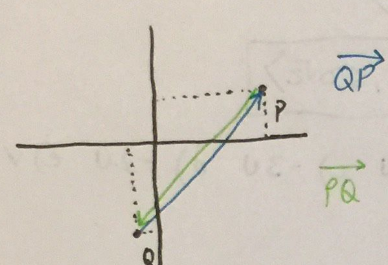
9/24/2018

pr.s: 1-47, 57, 59, 81, 86, 87

1) points do have a location but no magnitude or direction. vectors do not have location but do have a magnitude, direction. ∴ point with a vector starting at that point would be a magnitude, direction and location.

2) A position vector is a vector that is described by two points (usually one is O, (0,0)).

3)



4) The line segment with same length and magnitude as $\overrightarrow{PQ}$ would be that vector (the position vector) if it was placed at O.

5) There are infinitely many vectors that are equal to '$\vec{v}$' because there are infinitely many vectors with the same $|\vec{v}|$ and $\theta_{\vec{v}}$ as it, just at different locations.

6) SEE NOTES "MTH254H-20180921-Lecture.txt"

7) SEE AFOREMENTIONED NOTES.

8) if $P=(x_1,y_1)$, $Q=(x_2,y_2)$, Then $\overrightarrow{PQ}$ is determined as $\boxed{(x_2-x_1, y_2-y_1)}$

9) $u=\langle x_1, y_1\rangle$ $v=\langle x_2, y_2\rangle$. Then $\vec{u}+\vec{v}=\boxed{\langle x_1+x_2, y_1+y_2\rangle}$

10) $v=\langle x_1, y_1\rangle$ $c = \text{in } \mathbb{R}$, $cv=\boxed{\langle cx_1, cy_1\rangle}$

11) $\vec{v}=\langle x_1, y_1\rangle$ $\boxed{|\vec{v}|=\sqrt{x_1^2+y_1^2}}$

12) unit vectors: $i:\langle 1,0\rangle$
$j:\langle 0,1\rangle$
$v=\langle v_1, v_2\rangle$
$\langle v_1 i + v_2 j\rangle$~

13) $P=(x_1,y_1)$ $Q=(x_2,y_2)$

$\overrightarrow{PQ}=\langle x_2-x_1, y_2-y_1\rangle$

$\boxed{|\overrightarrow{PQ}|=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}}$

14) find angle of $\vec{v}$. find a vector which has same angle but $|\vec{U}| = 1$.

or ↳ find $|\vec{v}|$. $\boxed{\vec{U} = \frac{1}{|\vec{v}|}\langle v_1, v_2 \rangle}$ Divide the initial vector by the magnitude of it.

↳ To find 2 of these, do $2\vec{U}$...

15) $v = \langle 3, -2 \rangle$ $\quad |\vec{v}| = \sqrt{(9+4)} = \sqrt{13}$ $\quad \vec{U} = \langle \frac{3}{\sqrt{13}}, -\frac{2}{\sqrt{13}} \rangle$

$10U = \boxed{\langle \frac{30}{\sqrt{13}}, \frac{-20}{\sqrt{13}} \rangle}$

16) $\cos(45) = \sin(45) = \frac{\sqrt{2}}{2}$ $\quad \vec{U} = \langle \frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2} \rangle$

$\vec{F} = 100U = \langle \frac{100\sqrt{2}}{2}, \frac{100\sqrt{2}}{2} \rangle = \boxed{\langle 50\sqrt{2}, 50\sqrt{2} \rangle}$

17) a, c, e $\quad$ 18) b, c, e $\quad$ 19) a) $3V$ b) $2U$ c) $-3U$ d) $-2U$ e) V

20) a) $2V$ b) $-2V$ c) $3U$ d) $-5U$ e) $-3U$

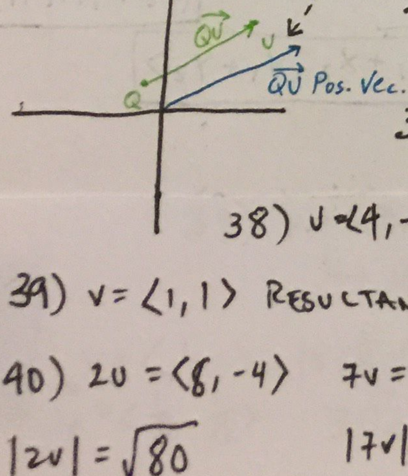
21) [only going to do a couple of these] a) $3U + 3V$ $\quad$ b) $2V + U$

22) ["] a) $3V + U$ $\quad$ b) $3V + U$ $\quad$ c) $2U + 2V$

23) ["] a) $(0,0) \to (3,2)$ $\quad \vec{OP} = \langle 3, 2 \rangle$ $\quad |\vec{OP}| = \sqrt{13}$

["] c) $(-6,-1) \to (4,2)$ $\quad \vec{RQ} = \langle 10, 3 \rangle$ $\quad |\vec{RQ}| = \sqrt{109}$

24) ["] $\quad$ 25) $\vec{QU}$, $\quad$ 26) ["] $\quad$ 27) ["] $\quad$ 28) $\langle 4,-2 \rangle + \langle -4, 6 \rangle = \boxed{\langle 0, 4 \rangle = 4j}$



29) $\langle 0,8 \rangle - \langle 4,-2 \rangle = \langle 0,8 \rangle + \langle -4, 2 \rangle = \boxed{\langle -4, 10 \rangle}$

34) $|\langle 3,-4 \rangle + \langle 1,1 \rangle| = |\langle 4,-3 \rangle| = \sqrt{25} = \boxed{5}$

35) $|-2v| : v = \langle 1,1 \rangle = |\langle -2,-2 \rangle| = \sqrt{8} = \boxed{2\sqrt{2}}$

38) $U = \langle 4,-2 \rangle$ RESULTANT: $\boxed{-4U, 4U} = \boxed{\langle -16, 8 \rangle, \langle 16, -8 \rangle}$

39) $V = \langle 1,1 \rangle$ RESULTANT: $\boxed{-3V, 3V} = \boxed{\langle -3,-3 \rangle, \langle 3, 3 \rangle}$

40) $2U = \langle 8, -4 \rangle$ $\quad 7V = \langle 7, 7 \rangle$ $\quad \therefore \boxed{7V > 2U}$

$|2V| = \sqrt{80}$ $\quad |7V| = \sqrt{98}$

41) $u = \langle 4,-2 \rangle$ $v = \langle 1,1 \rangle$ $w = \langle 0,8 \rangle$

$u - v = \langle 3,-3 \rangle$ $|u-v| = \sqrt{18}$

$w - u = \langle -4,10 \rangle$ $|w-u| = \sqrt{116}$ $\therefore$ $\boxed{w-u > u-v}$

42) $\vec{PQ}$ $P = (-4,1)$ $Q = (3,-4)$ $\vec{PQ} = \langle 3+4, -4-1 \rangle$ $\vec{PQ} = \langle 7,-5 \rangle$

$\vec{PQ} = \boxed{7i - 5j}$

43) $\vec{QR}$ $Q = (3,-4)$ $R = (2,6)$ $\vec{QR} = \langle 2-3, 6+4 \rangle$ $\vec{QR} = \langle -1, 10 \rangle = \boxed{-i + 10j}$

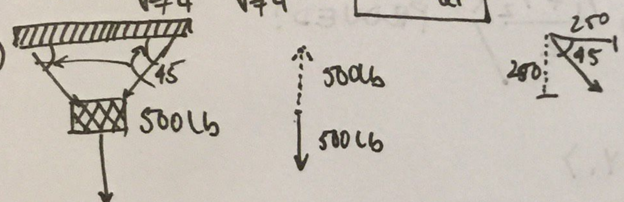
44) $\vec{QR} = \langle -1, 10 \rangle$ $|\vec{QR}| = \sqrt{101}$ $\boxed{U_{QR} = \left\langle \frac{-1}{\sqrt{101}}, \frac{10}{\sqrt{101}} \right\rangle}$

45) $\vec{PR}$ $P = (-4,1)$ ~~$R = (3,-4)$~~ $R = (2,6)$ $\vec{PR} = \langle 6,5 \rangle$ $|\vec{PR}| = \sqrt{61}$

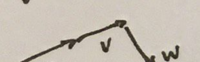
$U_{PR} = \left\langle \frac{6}{\sqrt{61}}, \frac{5}{\sqrt{61}} \right\rangle$ RESULTANT: $\boxed{\pm U_{PR}}$

46) [SAME AS 47.] 47) $\vec{QP}$ $Q = (3,-4)$ $P = (-4,1)$ $\vec{QP} = \langle -7, 5 \rangle$ $|\vec{QP}| = \sqrt{74}$

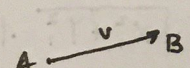
$U_{\vec{QP}} = \left\langle -\frac{7}{\sqrt{74}}, \frac{5}{\sqrt{74}} \right\rangle$ $\boxed{\pm 4 U_{QP}}$

57) 

Each Chain is $\langle 250, 250 \rangle$
(NEG's Don't count...)
$|\text{CHAIN}| = \sqrt{125000}$ lb Per Chain

59) a) 

YES, AS $u + v + w = u + w + v$...

b) 

YES, $-u$ would work.

c) NO, if ~~vec~~ v is a different angle that cancels out u

d) NO, JUST NO!

e) NO

f) Nope - they're the same but at different locations

g) NO, their magnitudes would not work that way

h) TRUE because... yeah...

81) $u + v = v + u$ $u = \langle u_1, u_2 \rangle$ $v = \langle v_1, v_2 \rangle$

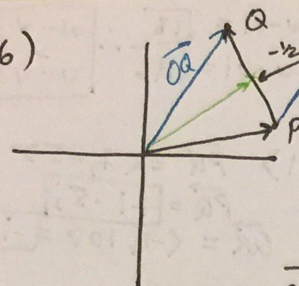
$\langle u_1, u_2 \rangle + \langle v_1, v_2 \rangle = \langle v_1, v_2 \rangle + \langle u_1, u_2 \rangle$

$\langle u_1, u_2 \rangle + \langle v_1, v_2 \rangle = \langle v_1 + u_1, v_2 + u_2 \rangle$

$= \langle u_1 + v_1, u_2 + v_2 \rangle$

$u + v = v + u =$

86)



NOTE: P, Q SET ARBITRARILY TO GET A VISUAL.

$\vec{OX}$ = Midpoint from origin

$P = (x_1, y_1) \quad Q = (x_2, y_2)$

$\vec{OX}$: Vector from O to point $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\therefore \vec{OX} = \left\langle \frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right\rangle$

Prove that:

$$\vec{OX} = \vec{OP} + \frac{1}{2}\vec{PQ}$$

$$\vec{OX} = \langle x_1, y_1 \rangle + \frac{1}{2}\vec{PQ}$$

$$\vec{OX} = \langle x_1, y_1 \rangle + \frac{1}{2}\langle x_2 - x_1, y_2 - y_1 \rangle$$

$$\left\langle \frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right\rangle = \langle x_1, y_1 \rangle + \left\langle \frac{x_2-x_1}{2}, \frac{y_2-y_1}{2} \right\rangle$$

$$= \left\langle \frac{2x_1}{2}, \frac{2y_1}{2} \right\rangle + \left\langle \frac{x_2-x_1}{2}, \frac{y_2-y_1}{2} \right\rangle$$

$$\left\langle \frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right\rangle = \left\langle \frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right\rangle$$ PROVED!

87) $\|c\vec{v}\| = |c|\|\vec{v}\| \qquad \vec{v} = \langle x_1, y_1 \rangle$

$$c\vec{v} = \langle cx_1, cy_1 \rangle$$

$$\|c\vec{v}\| = \sqrt{c^2x_1^2 + c^2y_1^2} = |c|\sqrt{x_1^2+y_1^2} = \|\vec{v}\| \cdot |c| = \sqrt{x_1^2+y_1^2} \cdot |c|$$