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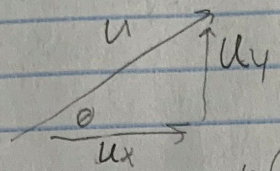
Homework Due 9/13
Sections 12.1 and 12.2

Sections 12.1 → #5, 7, 9, 11, 15, 21, 41, 47:

(5) Find the components of u

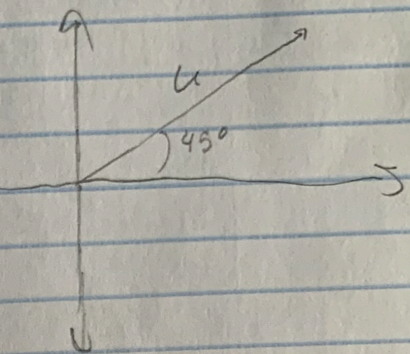


$u(\sin(45) = \frac{u_y}{u})$

$u\sin(45) = u_y$

$u(\cos(45°) = \frac{u_x}{u})$

$u\cos(45°) = u_x$



$u = \langle u_x, u_y \rangle$

$u = \langle u\cos\theta, u\sin\theta \rangle$

where u is the magnitude of the vector

$u = \langle |u|\cos(45°), |u|\sin(45°) \rangle$

$u = \langle |u|\cos(\frac{\pi}{4}), |u|\sin(\frac{\pi}{4}) \rangle$

$\boxed{u = \langle \frac{\sqrt{2}}{2}|u|, \frac{\sqrt{2}}{2}|u| \rangle}$

(7) Find The Components OF W

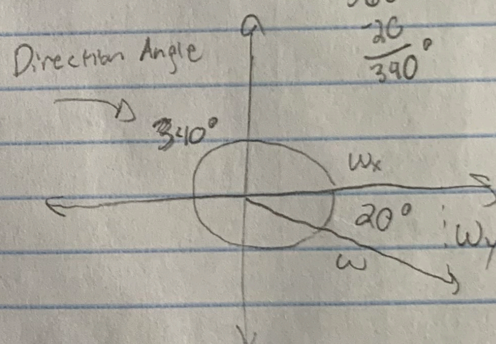
$\theta = -20°$

$w = \langle w_x, w_y \rangle$

$w = \langle |w|\cos(340°), |w|\sin(340°) \rangle$

$w = \langle .939|w|, -.342|w| \rangle$

360
-20
340°



(9) Find components of $\overrightarrow{PQ}$

$P = \langle 3, 2 \rangle$, $Q = \langle 2, 7 \rangle$

$\overrightarrow{PQ} = \langle 2-3, 7-2 \rangle = \boxed{\langle -1, 5 \rangle}$

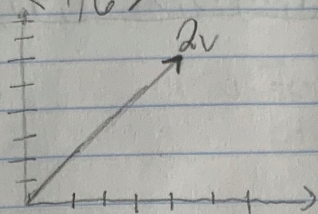
(11) $P = \langle 3, 5 \rangle$, $Q = \langle 1, -4 \rangle$

$\overrightarrow{PQ} = \langle 1-3, -4-5 \rangle$

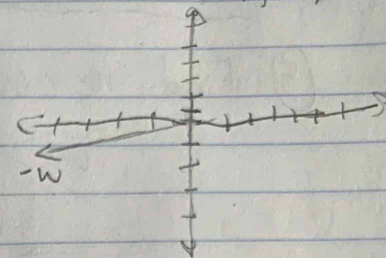
$= \boxed{\langle -2, -9 \rangle}$

(15) $5\langle 6, 2 \rangle = \boxed{\langle 30, 10 \rangle}$

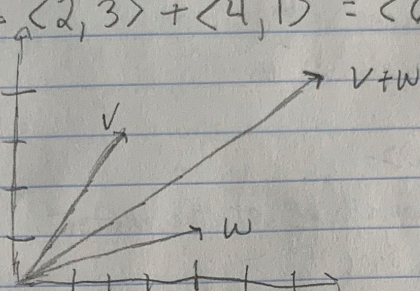
(21) $2v = \langle 4, 6 \rangle$



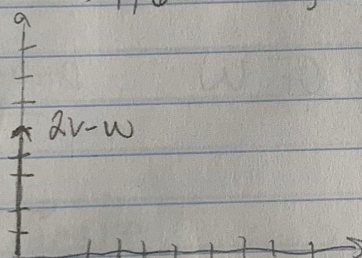
$-w = \langle -4, -1 \rangle$



$v + w = \langle 2, 3 \rangle + \langle 4, 1 \rangle = \langle 6, 4 \rangle$



$2v - w = \langle 4, 6 \rangle - \langle 4, 1 \rangle = \langle 0, 5 \rangle$



(41) Unit Vector e_v where $v = \langle 3, 4 \rangle$ → Unit Vector (Vector with length of 1)

$e_v = \frac{v}{|v|}$ $\quad |v| = \sqrt{3^2 + 4^2} = \sqrt{25} = 5$ → Magnitude Is Always Positive

$$\boxed{e_v = \left\langle \frac{3}{5}, \frac{4}{5} \right\rangle}$$

(47) Unit vector e making an angle of $\frac{4\pi}{7}$ with the x axis

$\theta = \frac{4\pi}{7}$

$e = \cos\left(\frac{4\pi}{7}\right) i + \sin\left(\frac{4\pi}{7}\right) j$

$$\boxed{e = \left\langle \cos\left(\frac{4\pi}{7}\right), \sin\left(\frac{4\pi}{7}\right) \right\rangle}$$

$\sqrt{\cos\left(\frac{4\pi}{7}\right)^2 + \sin\left(\frac{4\pi}{7}\right)^2} = 1$ ✓

Homework Due 9/13

Section 12.2

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Section 12.2: #11, 13, 19, 25, 27, 31, 49, 51;

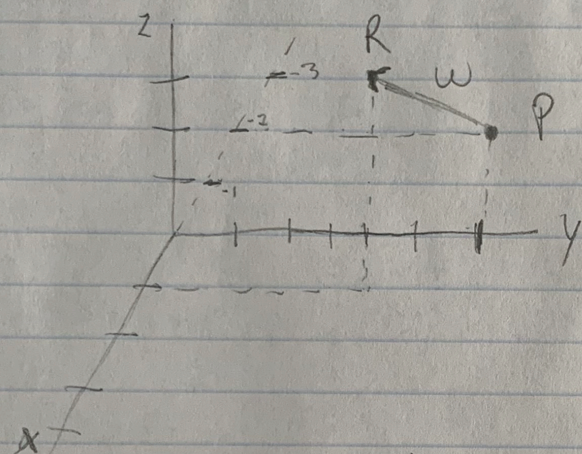
(11) Find the point P such that $w = \overrightarrow{PR}$ has components $\langle 3, -2, 3 \rangle$ + sketch w

$R = \langle 1, 4, 3 \rangle$

$\overset{R}{(1, 4, 3)} - \overset{P}{(x, y, z)} = \langle 3, -2, 3 \rangle$

$\boxed{P = (-2, 6, 0)}$

$w = \langle 3, -2, 3 \rangle$



(13) a) Parallel and in same direction b) Neither
c) Neither d) Neither

b, c, + d are not scalars

(19) $-2\langle 8, 11, 3 \rangle + 4\langle 2, 1, 1 \rangle = \langle -16, -22, -6 \rangle + \langle 8, 4, 4 \rangle$
$= \boxed{\langle -8, -18, -2 \rangle}$

(25) $u = \langle 4, 2, -6 \rangle$, $v = \langle 2, -1, 3 \rangle$

2 vectors are parallel if they are scalars of one another. Therefore u + v are not parallel.

(27) $u = \langle -3, 1, 4 \rangle$ $v = \langle 6, -2, 8 \rangle$

↳ Vectors aren't scalars of one another

↳ So Not Parallel

(31) Unit vector in the direction opposite to $v=\langle -4,4,2\rangle$

Find unit vector and multiply be -1

$|v| = \sqrt{(-4)^2+(4)^2+(2)^2} = \sqrt{36} = 6 \rightarrow$ can never have negative magnitude

unit vector of $v = \langle \frac{-4}{6}, \frac{4}{6}, \frac{2}{6} \rangle$

$= \langle -\frac{2}{3}, \frac{2}{3}, \frac{1}{3} \rangle \cdot -1$

$= \boxed{\langle \frac{2}{3}, -\frac{2}{3}, -\frac{1}{3} \rangle}$

(49) vector parameterization depends on the parameter or value of t

1^{st} parameterization $\rightarrow \langle 5,5,2\rangle + t\langle 0,-2,1\rangle$

Now suppose $t = 2t$ is the parameter $\rightarrow \langle 5,5,2\rangle + 2t\langle 0,-2,1\rangle$

$= \langle 5,5,2\rangle + t\langle 0,-4,2\rangle$

(51) Show $r_1(t) = \langle -1,2,2\rangle + t\langle 4,-2,1\rangle$ + $r_2(t) = \langle 0,1,1\rangle + t\langle 2,0,1\rangle$ don't intersect

$r_1(t) = \langle -1+4t, 2-2t, 2+t\rangle$

$r_2(t) = \langle 2t, 1, 1+1t\rangle \leftarrow$ Substitute in s + set components equal $r_1(t) = r_2(s)$

$-1+4t = 2s$ $\quad t=\frac{1}{2} \rightarrow -1+4(\frac{1}{2}) = 2s = \frac{1}{2} = \frac{2s}{2}$ $\quad s=\frac{1}{2}$

$2-2t = 1 \rightarrow -2t = -1 \quad t = \frac{1}{2}$

$2+t = 1+s$

$2+\frac{1}{2} \neq 1+\frac{1}{2}$

The values of t and s when plugged into the z component (assuming $t=\frac{1}{2}$ + $s=\frac{1}{2}$) result in different values in r_1 + r_2.

Thus, we determine, the lines do not intersect.