

Warm-up

May 11, 2017

Write the vector in component form as well as a linear combination. Then find the magnitude and direction.

$P(x_1, y_1) Q(x_2, y_2)$
 $P(2, -7) Q(10, -30)$

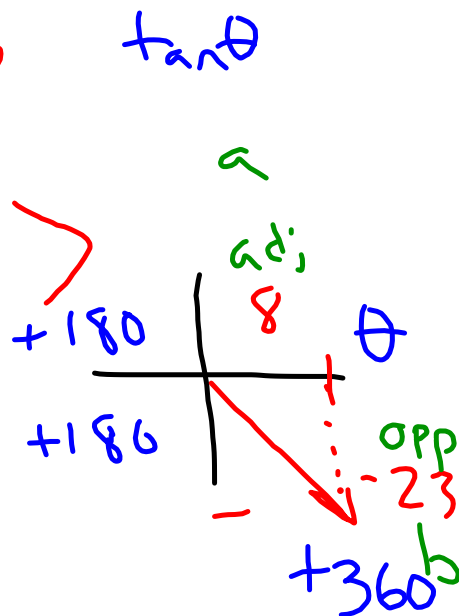
Initial Terminal

$$\langle x_2 - x_1, y_2 - y_1 \rangle$$

$$\langle 10 - 2, -30 - (-7) \rangle$$

$$\langle 8, -23 \rangle$$

$$8i - 23j$$



$$\begin{aligned} |\vec{PQ}| &= \sqrt{a^2 + b^2} \\ &= \sqrt{8^2 + (-23)^2} \\ &= \sqrt{64 + 529} \end{aligned}$$

$$= \sqrt{593} \text{ or } 24.35$$

$$\theta = \tan^{-1}\left(\frac{b}{a}\right) = \tan^{-1}\left(\frac{-23}{8}\right)$$

$$\begin{aligned} &= -70.82^\circ \\ &= \cancel{+360^\circ} \\ &= 289.18^\circ \end{aligned}$$

$P(2, -7)$

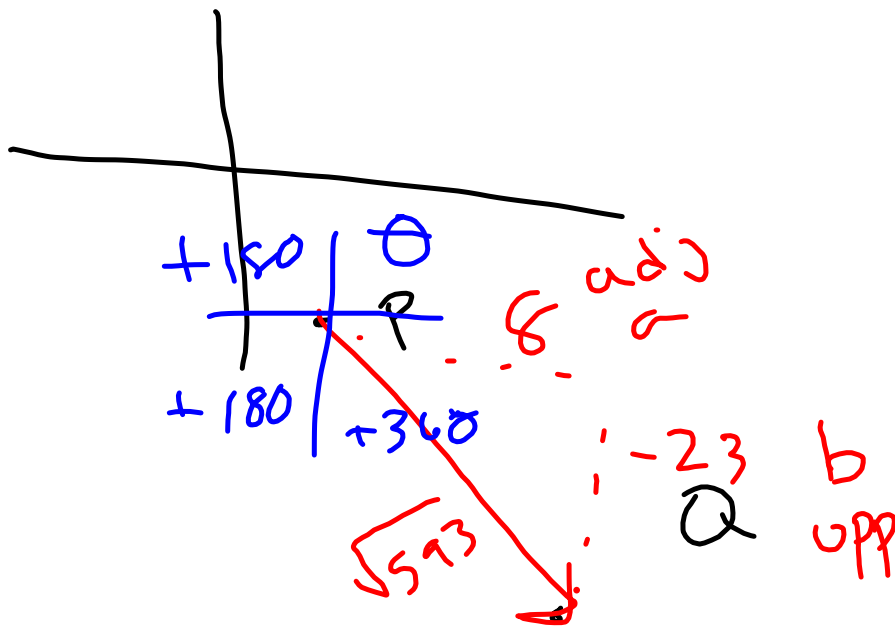
$Q(10, -30)$

$$\frac{(10-2)}{(-30-(-7))} = \frac{8}{-23}$$

$\langle \vec{a}, \vec{b} \rangle$
 $\langle 8, -23 \rangle$
 a, b

$$\tan^{-1}\left(\frac{-23}{8}\right) = -70.82 + 360$$

289.18



$$\begin{aligned} |\vec{PQ}| &= \sqrt{a^2 + b^2} \\ &= \sqrt{8^2 + (-23)^2} \\ &= \sqrt{64 + 529} \\ &= \sqrt{593} \end{aligned}$$

$\langle 8i - 23j \rangle$ (Comp)



$8i - 23j$ linear

-70.82
 $+ 360$

$\sqrt{8^2 + (-23)^2}$

$\sqrt{64 + 529}$

$\sqrt{593}$ mag.

	tan	
$+180$		\ominus
$+180$		$+360$

$\tan^{-1}\left(\frac{-23}{8}\right) = -70.82$
 $+ 360$

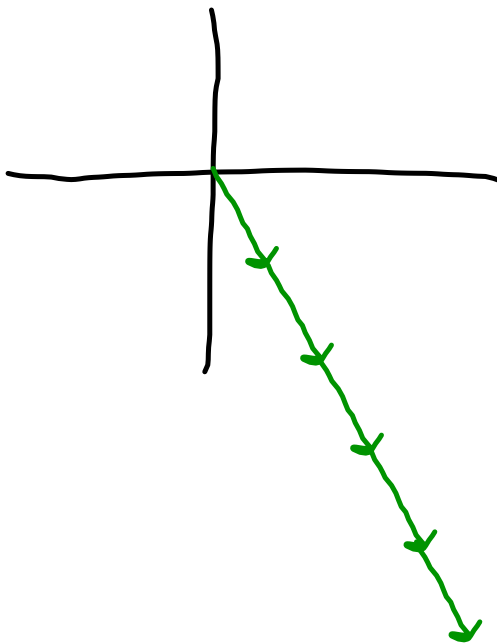
289.18°
Direction

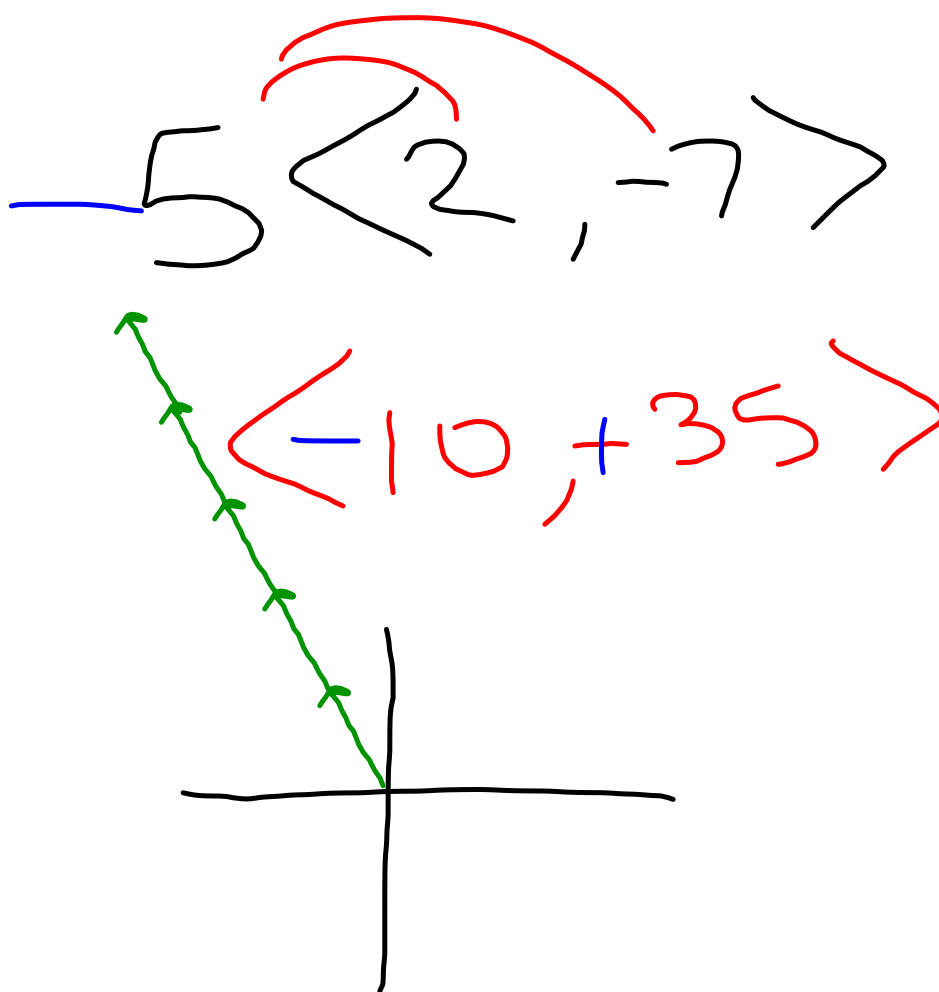
$$5[2, -7]$$

$$[10, -35]$$

$$5 \langle 2, -7 \rangle$$

$$\langle 10, -35 \rangle$$





$$\vec{v} = \langle a, b \rangle$$

$$\textcircled{1} \quad |\vec{v}| = \sqrt{a^2 + b^2}$$

$$\textcircled{2} \quad \frac{1}{|\vec{v}|} \langle a, b \rangle$$

$$= \left\langle \frac{a}{|\vec{v}|}, \frac{b}{|\vec{v}|} \right\rangle$$

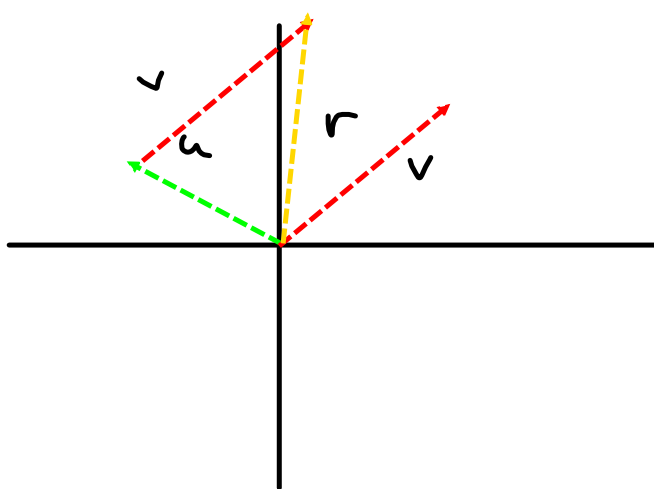
$$\vec{v} = \langle 3, 4 \rangle$$

$$|\vec{v}| = \sqrt{3^2 + 4^2}$$
$$= \sqrt{25}$$
$$= 5$$

$$\frac{1}{5} \langle 3, 4 \rangle$$

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

⑮ $u + v$



Find vector \vec{v} with the same direction as \vec{u} .

$$\|\vec{v}\| = 18$$

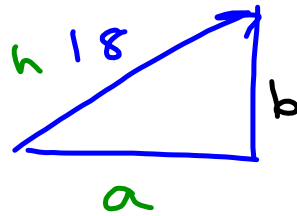
$$\vec{u} = \langle 4, 2 \rangle$$



$$\langle a, b \rangle$$

$$\langle 18 \cos(26.6), 18 \sin(26.6) \rangle$$

$$\langle 16.1, 8.1 \rangle$$



$$\theta = \tan^{-1}\left(\frac{2}{4}\right) = 26.6^\circ$$

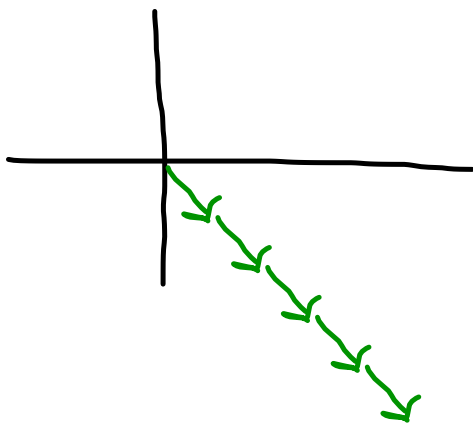
$$I: 26.6$$

$$18 \cos(26.6) = \frac{a}{18} \quad 18 \cdot \sin(26.6) = \frac{b}{18}$$

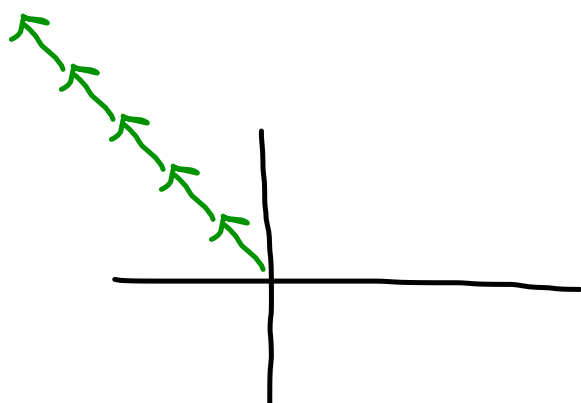
$$5 [1, -3]$$

$$[5, -15]$$

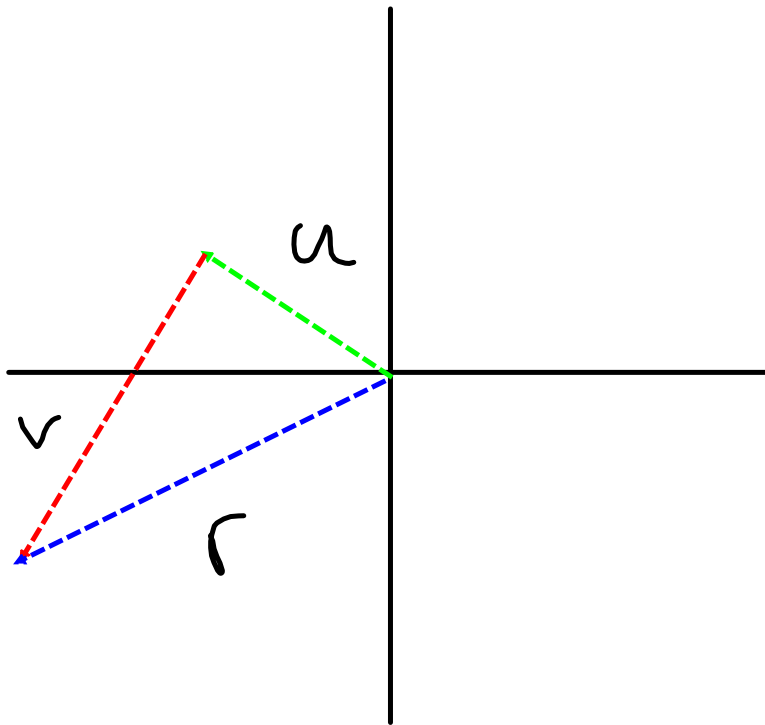
$$5 \langle 1, -3 \rangle$$
$$\langle 5, -15 \rangle$$



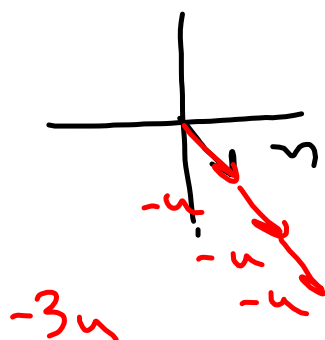
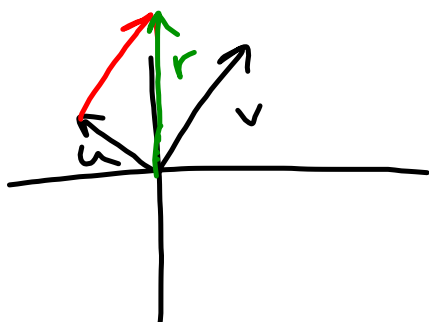
$$-5 \langle 1, -3 \rangle$$
$$\langle -5, +15 \rangle$$



$$u + v$$



(5)
 $u+v$



Find the component form of the vector as well as its linear combination, magnitude, and direction.

$$P(-1, 4) \quad Q(9, -7) \quad \text{TERMINAL-INITIAL}$$

$x_1, y_1 \quad x_2, y_2$

$$\langle a, b \rangle$$
$$\langle 10, -11 \rangle \quad \text{component form}$$

$$10i - 11j \quad \text{linear combination}$$

magnitude

$$|\vec{PQ}| = \sqrt{a^2 + b^2}$$

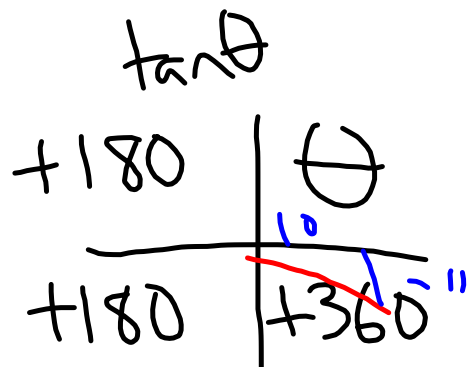
$$= \sqrt{10^2 + (-11)^2} = \sqrt{221}$$

Direction

$$\theta = \tan^{-1}\left(\frac{b}{a}\right)$$

$$= \tan^{-1}\left(-\frac{11}{10}\right) = -47'$$

$$\frac{\quad +360}{313}$$



$$v = \langle 2, 3 \rangle \quad u = \langle 0, 5 \rangle$$

Find $u - 3v$

$$\begin{aligned} & \langle 0, 5 \rangle - 3 \langle 2, 3 \rangle \\ & \langle 0, 5 \rangle - \langle 6, 9 \rangle \\ & \langle -6, -4 \rangle \end{aligned}$$

Find the unit vector

$$\langle -2, 9 \rangle \quad \vec{v} = \langle a, b \rangle$$

$$\sqrt{85}$$

$$\textcircled{1} \quad |\vec{v}| = \sqrt{a^2 + b^2}$$

$$\frac{1}{\sqrt{85}} \langle -2, 9 \rangle$$

$$\textcircled{2} \quad \frac{1}{|\vec{v}|} \langle a, b \rangle$$

$$\left\langle \frac{-2\sqrt{85}}{85}, \frac{9\sqrt{85}}{85} \right\rangle$$

$$= \left\langle \frac{-2 \cdot \sqrt{85}}{\sqrt{85} \cdot \sqrt{85}}, \frac{9 \cdot \sqrt{85}}{\sqrt{85} \cdot \sqrt{85}} \right\rangle$$

$$= \left\langle \frac{a}{|\vec{v}|}, \frac{b}{|\vec{v}|} \right\rangle$$