6.1 and 6.2 Assessment (Vectors) Name_____

Are $\overrightarrow{RS}$ and $\overrightarrow{OP}$ equivalent vectors? Explain.

1) R = (6, 9), S = (10, 16), O = (2, 3), and P = (7, 10)

<4, 7> <5, 7> No not same components

2) R = (–8, –6), S = (–7, –14), O = (2, 7), and P = (–13, –1)

<1, –8> <–15, –8> No

Find the component form and magnitude of the indicated vector.

3) Given that P = (x_2, y_2) = (–7, 10) and Q = (x_1, y_1) = (–8, 1), find the component form and magnitude of the vector $\overrightarrow{QP}$.

$-7-{-8}, 10-1$

$\langle 1, 9 \rangle$ $|\overrightarrow{QP}| = \sqrt{1^2+9^2} = \sqrt{82}$

4) Given that P = (x_1, y_1) = (–5, 5) and Q = (x_2, y_2) = (–13, 6), find the component form and magnitude of the vector $2\overrightarrow{PQ}$.

$\langle -8, 1 \rangle$ $2\overrightarrow{PQ} = \langle -16, 2 \rangle$ $|2\overrightarrow{PQ}| = \sqrt{(-16)^2+2^2} = \sqrt{260} = 2\sqrt{65}$

Find the component form of the indicated operation.

5) Let **u** = ⟨9, 6⟩, **v** = ⟨–5, –5⟩. Find 6**u** – **v**.

$6u = \langle 54, 36 \rangle$ $54-{-5}, 36-{-5} = \langle 59, 41 \rangle$

Find the component form of the indicated vector.

6) Let **u** = ⟨–5, 2⟩, **v** = ⟨–2, 6⟩. Find 4**u** + 3**v**. $= \langle -26, 26 \rangle$

$4u = \langle -20, 8 \rangle$ $3v \langle -6, 18 \rangle$

Find the unit vector in the direction of the given vector. Write your answer in the indicated form.

7) Let **u** = ⟨–2, –3⟩. Find the unit vector in the direction of **u**, and write your answer as a linear combination of the standard unit vectors **i** and **j**. $|u| = \sqrt{4+9} = \sqrt{13}$ unit vector $= \langle \frac{-2}{\sqrt{13}} i - \frac{3}{\sqrt{13}} j \rangle$

8) Let **u** = ⟨2, 1⟩. Find the unit vector in the direction of **u**, and write your answer in component form.

$|u| = \sqrt{5}$

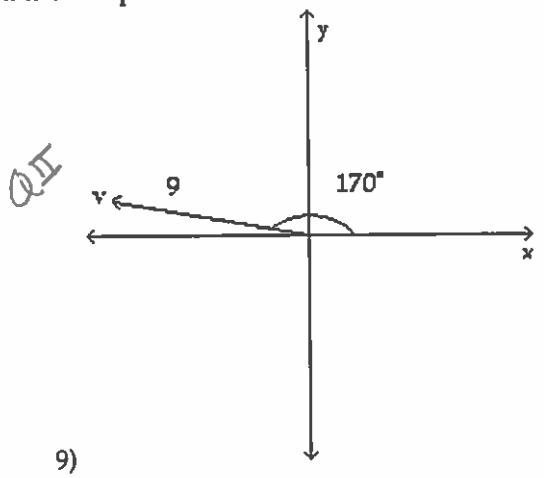
unit vector $= \langle \frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}} \rangle$

or $\langle \frac{2\sqrt{5}}{5}, \frac{\sqrt{5}}{5} \rangle$

$\langle -\frac{2\sqrt{13}}{13} i - \frac{3\sqrt{13}}{13} j \rangle$

Find the component form of the vector v.

9)

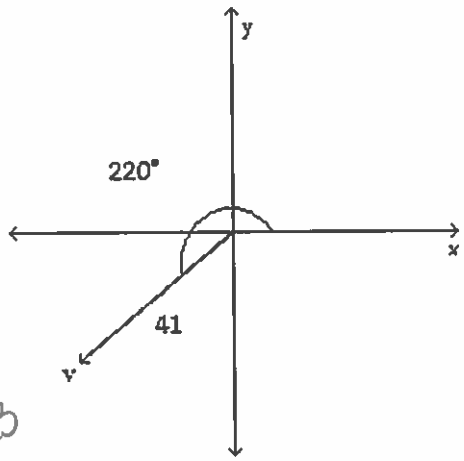


QII

$9\cos 170°, 9\sin 170°$

$\langle -8.86, 1.56 \rangle$

10)



Q3

$41\cos 220°, 41\sin 220°$

$\langle -31.41, -26.35 \rangle$

Find the magnitude and direction angle for the following vector. Give the direction angle as an angle in $[0°, 360°)$ rounded to the nearest tenth.

11) $\langle 11, -13 \rangle$

$a = |u|\cos\theta$

$|u| = \sqrt{11^2 + (-13)^2} = \sqrt{290}$

$\theta = \cos^{-1}\left(\frac{a}{|u|}\right) \overset{\cos^{-1}}{=} \left(\frac{11}{\sqrt{290}}\right)$ $\theta \approx 49.8°$

Find $a \cdot b$.

12) $a = \langle 5, -10 \rangle$, $b = \langle 6, 5 \rangle$

$5(6) + (-10)(5)$ $a \cdot b = -20$

13) $a = 9i + 8j$, $b = -4i + 4j$

$9(-4) + 8(4)$ $a \cdot b = -4$

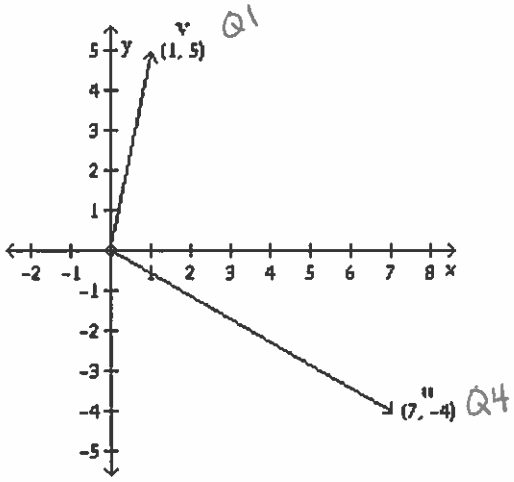
14) $\mathbf{a} = 6\mathbf{j}$, $\mathbf{b} = \mathbf{i} + 4\mathbf{j}$

$\langle 0, 6 \rangle$ $\langle 1, 4 \rangle$ $a \cdot b = 24$

$0(1) + 6(4)$

Find the angle between the given vectors to the nearest tenth of a degree.

15)



$\cos\theta = \frac{u \cdot v}{|u||v|}$

$\theta = \cos^{-1}\left(\frac{-13}{\sqrt{50} \cdot \sqrt{65}}\right)$

$\theta \approx 103.2^\circ$

$u \cdot v = 1(7) + 5(-4)$
$= -13$

$|u| = \sqrt{1^2 + 7^2} = \sqrt{50} = 5\sqrt{2}$

$|v| = \sqrt{49 + 16} = \sqrt{65}$

16) $\mathbf{u} = \left(5\cos\frac{\pi}{6}\right)\mathbf{i} + \left(5\sin\frac{\pi}{6}\right)\mathbf{j}$, $\mathbf{v} = \left(\cos\frac{4\pi}{3}\right)\mathbf{i} + \left(\sin\frac{4\pi}{3}\right)\mathbf{j}$

$5\left(\frac{\sqrt{3}}{2}\right)i + 5\left(\frac{1}{2}\right)j$ $-\frac{1}{2}i + -\frac{\sqrt{3}}{2}j$

$u = \left\langle \frac{5\sqrt{3}}{2}, \frac{5}{2} \right\rangle$ $v = \left\langle -\frac{1}{2}, -\frac{\sqrt{3}}{2} \right\rangle$

$|u| = \sqrt{\left(\frac{5\sqrt{3}}{2}\right)^2 + \left(\frac{5}{2}\right)^2}$ $v = \sqrt{\left(-\frac{1}{2}\right)^2 + \left(-\frac{\sqrt{3}}{2}\right)^2}$

$= 5$ $= 1$

$u \cdot v = -2.165 + -2.165 = -4.33$

$\cos\theta = \frac{u \cdot v}{|u||v|} = \frac{-4.33}{5}$

$\theta \approx 150^\circ$ (#16)

17) $\mathbf{u} = \sqrt{5}\mathbf{i} - 9\mathbf{j}$, $\mathbf{v} = \sqrt{5}\mathbf{i} + \mathbf{j}$

$|u| = \sqrt{86}$ $|v| = \sqrt{6}$ $u \cdot v = 5 - 9 = -4$

$\cos\theta = \frac{-4}{\sqrt{86} \cdot \sqrt{6}}$ $\theta = \cos^{-1}\left(\frac{-4}{\sqrt{516}}\right)$ $\theta \approx 100.1^\circ$

Are the two vectors orthogonal? Use your work to explain.

18) $\mathbf{u} = \langle 6, -2 \rangle$, $\mathbf{v} = \langle 8, 24 \rangle$

$u \cdot v = 48 - 48 = 0$ yes

19) $\mathbf{u} = \langle 7, 2 \rangle$, $\mathbf{v} = \langle 21, 6 \rangle$

$u \cdot v = 7 \cdot 21 + 12 \neq 0$

no