Class Name : **Math 127 - Fall 2020 - 3007**

Instructor Name : **Scheib**

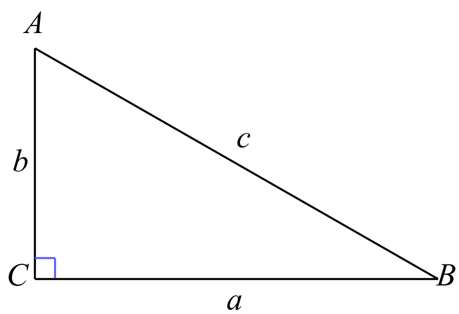
Student Name : Answer Key

Instructor Note :

Question 1 of 16

Solve the right triangle for the unknown sides and angles. Round values to 1 decimal place if necessary.

$A=28.3°$, $a=29$



$B =$ ______ °

$b \approx$ ______

$c \approx$ ______

Question 2 of 16

An aerial tram takes passengers from an elevation of 6314 ft to an elevation of $10{,}455$ ft up the slope of a mountain. If the tram runs on a cable measuring $13{,}865$ ft in length, what is the angle of incline of the tram to the nearest tenth of a degree?

The angle of incline of the tram is approximately ______ °.

Question 3 of 16

Solve $\triangle ABC$ subject to the given conditions, if possible. Round the lengths of the sides and measures of the angles (in degrees) to 1 decimal place if necessary. Round intermediate steps to at least four decimal places.

$$b = 88.5,\ c = 30,\ A = 108.5^\circ$$

- ○ The triangle with these conditions does not exist.
- ○ The triangle with these conditions does exist.

$a \approx$ ________

$B \approx$ ________ $^\circ$

$C \approx$ ________ $^\circ$

Question 4 of 16

Information is given about $\triangle ABC$. Determine if the information gives one triangle, two triangles, or no triangle. Solve the resulting triangle(s). Round the lengths of the sides and measures of the angles to 1 decimal place if necessary.

$$a = 48.1,\ c = 39.1,\ C = 24^\circ$$

- There is no triangle that can be formed from the given information.
- There is one unique triangle that can be formed from the given information.

  $A =$ ______ °

  $B \approx$ ______ °

  $b \approx$ ______

- There are two triangles that can be formed from the given information.

  Triangle 1:

  $A \approx$ ______ °

  $B \approx$ ______ °

  $b \approx$ ______

  Triangle 2:

  $A \approx$ ______ °

  $B \approx$ ______ °

  $b \approx$ ______

Question 5 of 16

Plot the points whose polar coordinates are given.

(a) $\left(3, -\frac{5\pi}{6}\right)$

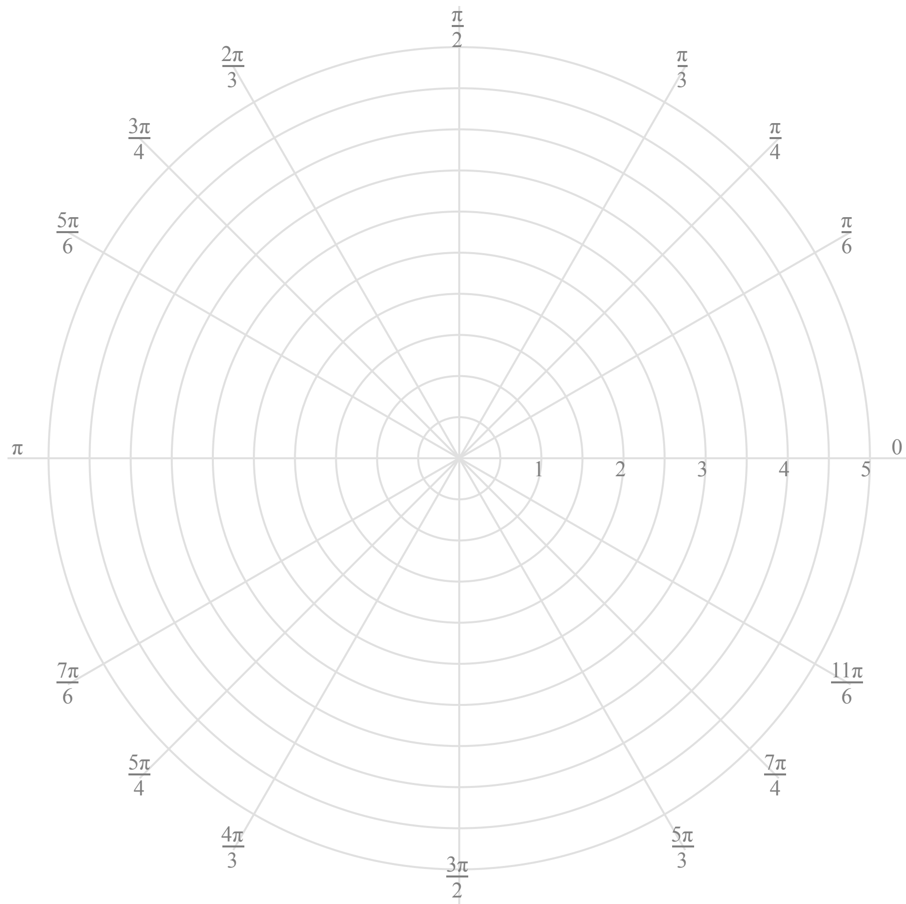
(b) $(2, -\pi)$

(c) $\left(-4, -\frac{\pi}{3}\right)$

(d) $\left(-5, -\frac{5\pi}{6}\right)$

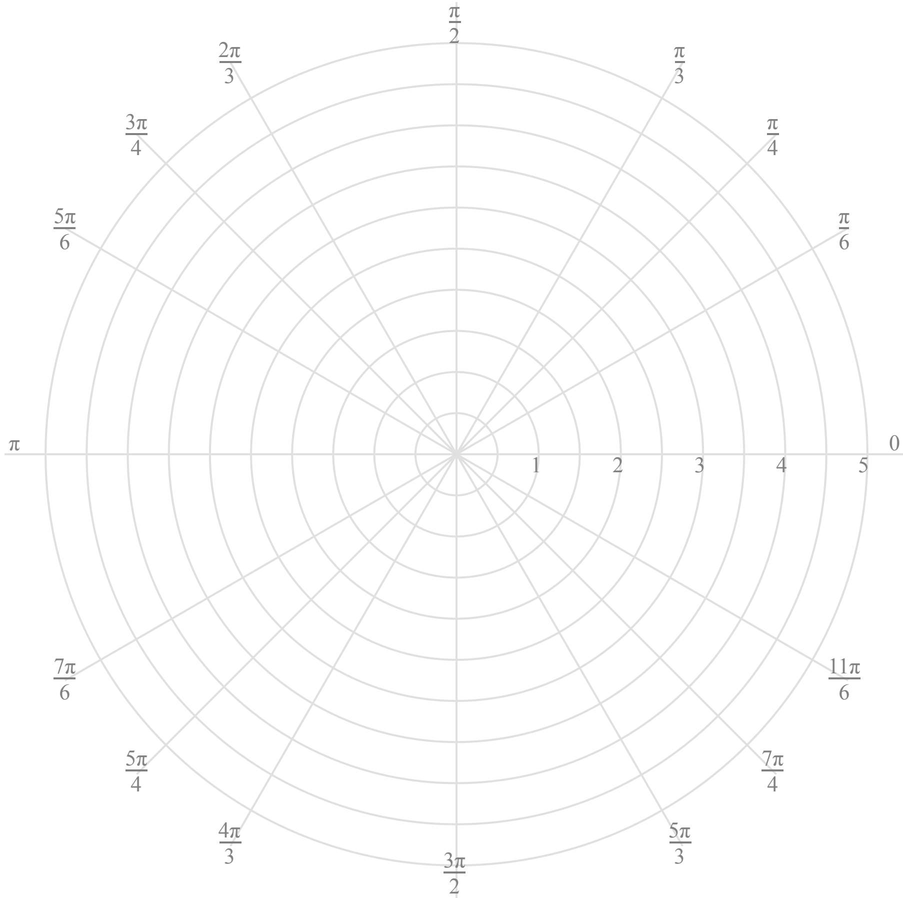
Part 1 of 4

(a) $\left(3, -\frac{5\pi}{6}\right)$



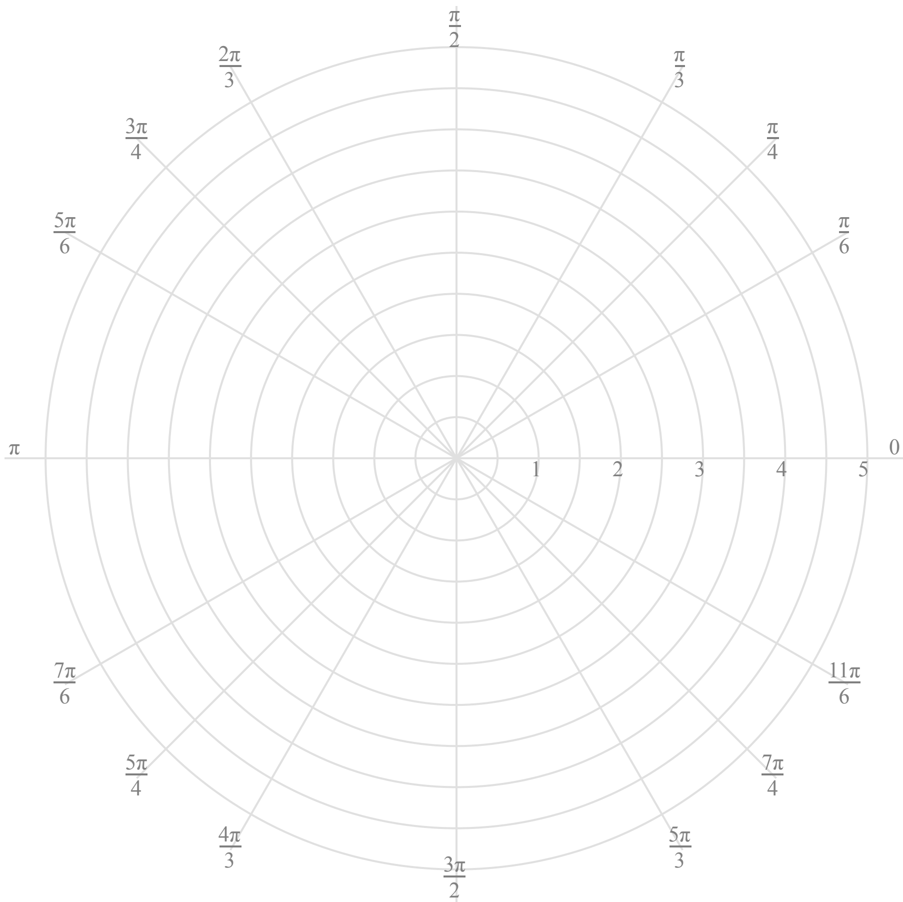
Part 2 of 4

(b) $(2, -\pi)$



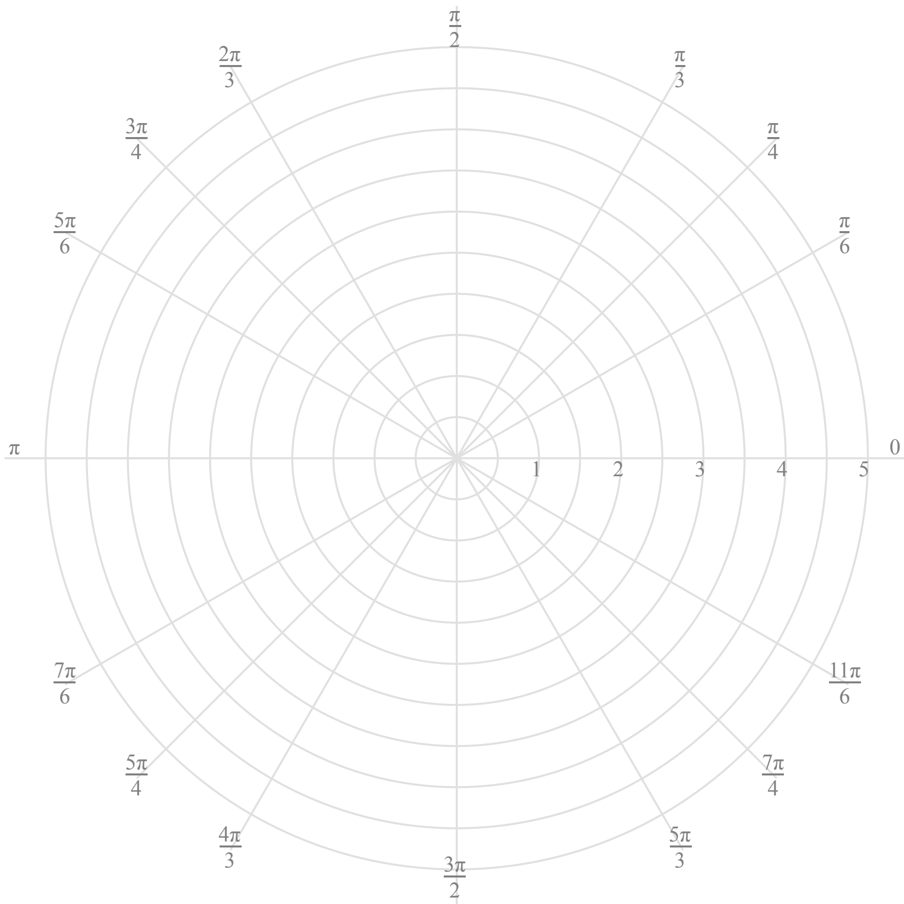
Part 3 of 4

(c) $\left(-4, -\frac{\pi}{3}\right)$



Part 4 of 4

(d) $\left(-5, -\frac{5\pi}{6}\right)$



Question 6 of 16

Given the point in polar coordinates $\left(3.3, \frac{3\pi}{4}\right)$, find two other polar coordinate representations.

Part 1 of 2

(a) Two other polar coordinate representations with $r>0$ and $-2\pi \le \theta \le 3\pi$ are
(__________ , __________) and (__________ , __________).

Part 2 of 2

(b) Two other polar coordinate representations with $r<0$ and $-\pi \le \theta \le 2\pi$ are $(\_\_\_\_\_, \_\_\_\_\_)$ and $(\_\_\_\_\_, \_\_\_\_\_)$.

Question 7 of 16

Convert the ordered pair in polar coordinates to rectangular coordinates. Use exact values. $\left(13, -\frac{\pi}{3}\right)$

The rectangular coordinates are $(\square, \square)$.

Question 8 of 16

Convert the ordered pair in rectangular coordinates to polar coordinates with $r>0$ and $0 \le \theta < 2\pi$. Give the exact values for r and θ.

$$\left(-7\sqrt{3}, 7\right)$$

Write your answer in simplest form.

The ordered pair in polar coordinates is $(\_\_\_\_\_, \_\_\_\_\_)$.

Question 9 of 16

Write an equivalent equation using polar coordinates.

$$x-2y=8$$

The polar equation is $r=$ __________ .

Question 10 of 16

Convert the polar equation to rectangular form and identify the type of curve represented.

$$r=2\sec\theta$$

Part 1 of 2

The type of curve represented is a ______________________________ .
(Blank 1)

Blank 1 Options

- horizontal line
- vertical line
- line that is nonhorizontal and nonvertical
- circle
- horizontal parabola
- vertical parabola

Part 2 of 2

Write the equation in standard form.

The rectangular form of the equation is ☐.

Question 11 of 16

Vector **v** has initial point $P(1, 2)$ and terminal point $Q(4, 11)$. Vector **w** has initial point $R(-6, 1)$ and terminal point $S(-3, 10)$.

(a) Find the magnitude of **v**. Give the exact answer.

(b) Find the magnitude of **w**. Give the exact answer.

(c) Determine whether $\mathbf{v} = \mathbf{w}$ and explain your reasoning.

Part 1 of 3

(a) Find the magnitude of **v**. Give the exact answer.

$\|\mathbf{v}\| =$ ______________

Part 2 of 3

(b) Find the magnitude of **w**. Give the exact answer.

$\|\mathbf{w}\| =$ ______

Part 3 of 3

(c) Determine whether $\mathbf{v} = \mathbf{w}$ and explain your reasoning.

v ______ (Blank 1) **w**, since the vectors have ______ (Blank 2) magnitude and ______ (Blank 3) direction.

Blank 1 Options	Blank 2 Options	Blank 3 Options
• $=$	• different	• different
• $\neq$	• the same	• the same

Question 12 of 16

Given a vector **v** with initial point $P(1, -3)$ and terminal point $Q(3, -4)$,

(a) Write the component form of **v**.

(b) Sketch **v** in standard position.

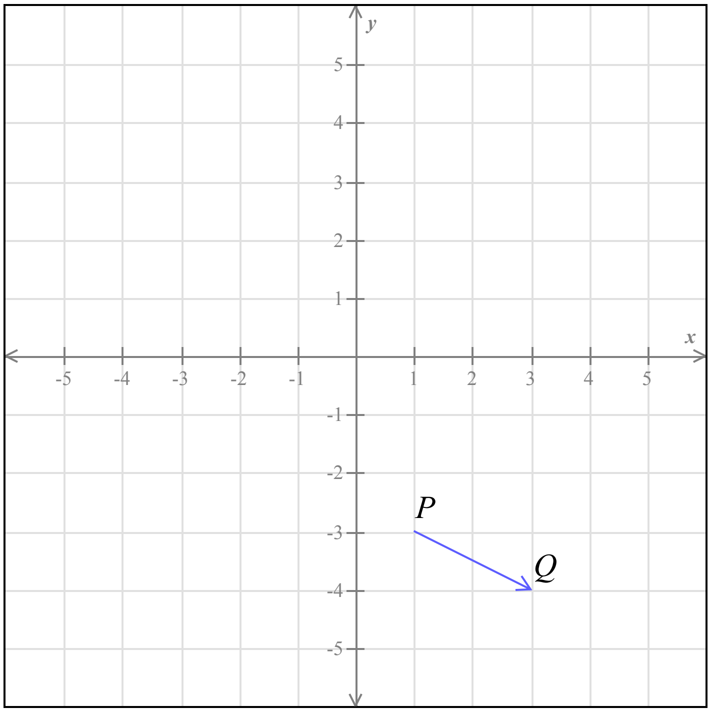
Part 1 of 2

(a) Write the component form of **v**.

$\langle$ ___ , ___ $\rangle$

Part 2 of 2

(b) Sketch **v** in standard position.



Question 13 of 16

Given **v** $=\langle 8, -13\rangle$ and **r** $=\langle 5, 9\rangle$,

find **v**−**r**.

v−**r** $=\langle$ ______ , ______ $\rangle$

Question 14 of 16

Write the vector **v** in the form $a\,\mathbf{i}+b\,\mathbf{j}$, where **v** has the given magnitude and direction angle. Give your answer in exact form.

$$\|\mathbf{v}\| = \frac{3}{5}, \theta = 300°$$

v = ______________________

Question 15 of 16

For $\mathbf{r} = \mathbf{i} - 1.3\mathbf{j}$, find the magnitude and direction angle for $0° \le \theta \le 360°$. Round to 1 decimal place.

$\|\mathbf{r}\| \approx$ ______

$\theta \approx$ ____________ $°$

Question 16 of 16

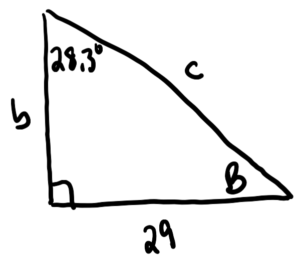
Determine if the vectors $\mathbf{p} = \langle 6, 18 \rangle$ and $\mathbf{q} = \langle -3, -9 \rangle$ are orthogonal, parallel, or neither.

p and **q** are ____________.
(Blank 1)

Blank 1 Options

- orthogonal
- parallel
- neither

1)

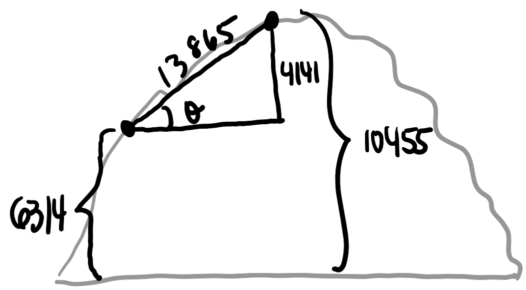


$$\tan 28.3^\circ = \frac{29}{b} \Rightarrow b = \frac{29}{\tan 28.3^\circ} = 53.9$$

$$\sin 28.3^\circ = \frac{29}{c} \Rightarrow c = \frac{29}{\sin 28.3^\circ} = 61.2$$

$$28.3^\circ + B + 90^\circ = 180^\circ \Rightarrow B = 61.7^\circ$$

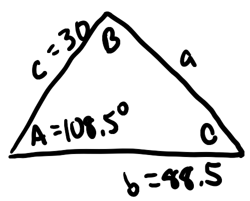
2)



$$10455 - 6314 = 4141$$

$$\sin\theta = \frac{4141}{13865} \Rightarrow \theta = \sin^{-1}\left(\frac{4141}{13865}\right) = 17.4^\circ$$

3)



SAS ⇒ Law of Cosines

$$a^2 = 88.5^2 + 30^2 - 2(88.5)(30)\cos 108.5^\circ = 10417.1377$$

$$a = \sqrt{10417.1377} = 102.1$$

$$30^2 = 102.1^2 + 88.5^2 - 2(102.1)(88.5)\cos C$$

$$900 = 18256.66 - 18071.7\cos C$$

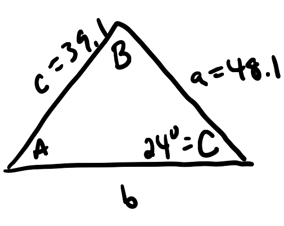
$$-17356.66 = -18071.7\cos C$$

$$\cos C = 0.9604$$

$$C = \cos^{-1}(0.9604) = 16.2^\circ$$

$$108.5^\circ + B + 16.2^\circ = 180^\circ \Rightarrow B = 55.3^\circ$$

4)



SSA ⇒ Law of Sines

$$\frac{\sin 24^\circ}{39.1} = \frac{\sin A}{48.1}$$

$39.1 \sin A = 48.1 \sin 24^\circ$

$\sin A = \dfrac{48.1 \sin 24^\circ}{39.1} = 0.5004$

$A = \sin^{-1}(0.5004) = 30.3^\circ$

$30.3^\circ + B + 24^\circ = 180^\circ \Rightarrow B = 125.7^\circ$

$\dfrac{\sin 24^\circ}{39.1} = \dfrac{\sin 125.7^\circ}{b}$

$b \sin 24^\circ = 39.1 \sin 125.7^\circ$

$b = \dfrac{39.1 \sin 125.7^\circ}{\sin 24^\circ} = 78.1$

$A_2 = 180^\circ - 30.3^\circ = 149.7^\circ$

$149.7^\circ + B_2 + 24 = 180^\circ \Rightarrow B_2 = 6.3^\circ$

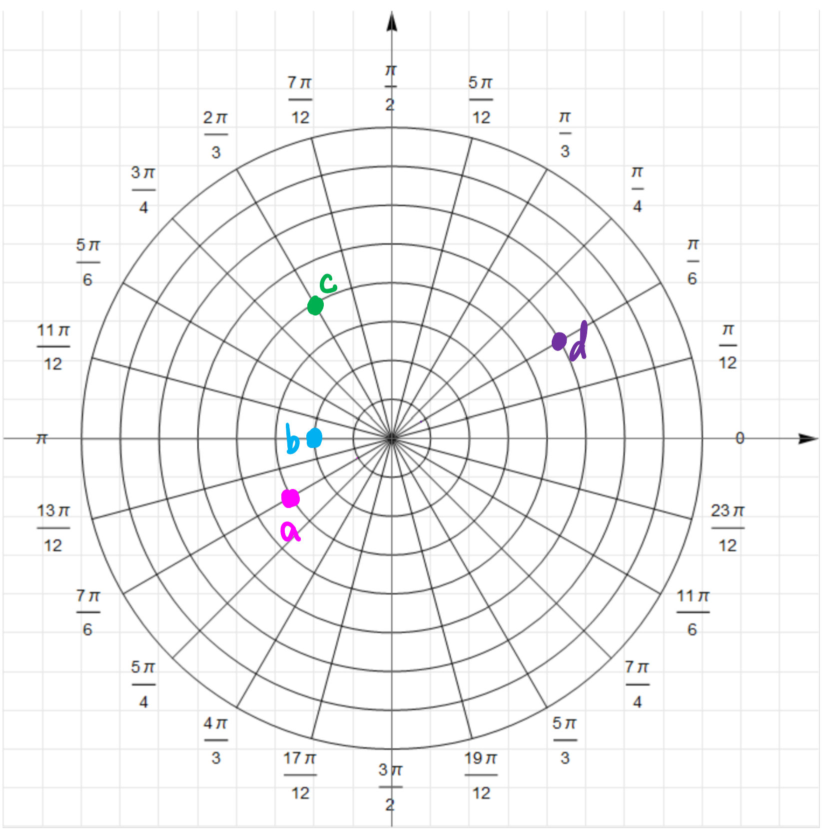
2^{nd} triangle exists

$\dfrac{\sin 24^\circ}{39.1} = \dfrac{\sin 6.3^\circ}{b}$

$b \sin 24^\circ = 39.1 \sin 6.3^\circ$

$b = \dfrac{39.1 \sin 6.3^\circ}{\sin 24^\circ} = 10.5$

5)



6) a) $\dfrac{3\pi}{4} + 2\pi = \dfrac{3\pi}{4} + \dfrac{8\pi}{4} = \dfrac{11\pi}{4}$

$\left(3.3, \dfrac{11\pi}{4}\right)$

$\dfrac{3\pi}{4} - 2\pi = \dfrac{3\pi}{4} - \dfrac{8\pi}{4} = -\dfrac{5\pi}{4}$

$\left(3.3, -\frac{5\pi}{4}\right)$

b) $\frac{3\pi}{4} + \pi = \frac{3\pi}{4} + \frac{4\pi}{4} = \frac{7\pi}{4}$

$\left(-3.3, \frac{7\pi}{4}\right)$

$\frac{3\pi}{4} - \pi = \frac{3\pi}{4} - \frac{4\pi}{4} = -\frac{\pi}{4}$

$\left(-3.3, -\frac{\pi}{4}\right)$

7) $x = r\cos\theta = 13\cos\left(-\frac{\pi}{3}\right) = 13\left(\frac{1}{2}\right) = \frac{13}{2}$

$y = r\sin\theta = 13\sin\left(-\frac{\pi}{3}\right) = 13\left(-\frac{\sqrt{3}}{2}\right) = -\frac{13\sqrt{3}}{2}$

$\left(\frac{13}{2}, -\frac{13\sqrt{3}}{2}\right)$

8) $r = \sqrt{x^2 + y^2} = \sqrt{(-7\sqrt{3})^2 + 7^2} = \sqrt{147 + 49} = \sqrt{196} = 14$

$\theta = \tan^{-1}\left(\frac{y}{x}\right) = \tan^{-1}\left(\frac{7}{-7\sqrt{3}}\right) = \tan^{-1}\left(-\frac{\sqrt{3}}{3}\right) = -\frac{\pi}{6}$

$(-7\sqrt{3}, 7) =$ quad II $\Rightarrow \theta = -\frac{\pi}{6} + \pi = \frac{5\pi}{6}$

$\left(14, \frac{5\pi}{6}\right)$

9) $\underbrace{x}_{r\cos\theta} - 2\underbrace{y}_{r\sin\theta} = 8$

$r\cos\theta - 2r\sin\theta = 8$

$r(\cos\theta - 2\sin\theta) = 8$

$r = \frac{8}{\cos\theta - 2\sin\theta}$

10) $r = 2\sec\theta$

$r = \frac{2}{\cos\theta}$

$\underbrace{r\cos\theta}_{x} = 2$

$x = 2 \Rightarrow$ vertical line

11) $\vec{v} = \langle 4-1, 11-2 \rangle = \langle 3, 9 \rangle$

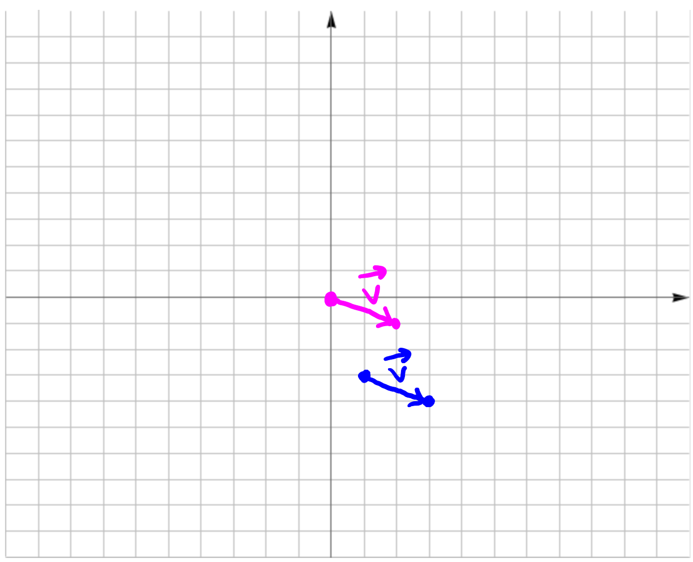
$\vec{w} = \langle -3-(-6), 10-1 \rangle = \langle 3, 9 \rangle$

a) $\|\vec{v}\| = \sqrt{3^2+9^2} = \sqrt{9+81} = \sqrt{90} = 3\sqrt{10}$

b) $\|\vec{w}\| = 3\sqrt{10}$

c) $\vec{v} = \vec{w}$, since the vectors have the same magnitude and same direction

12) $\vec{v} = \langle 3-1, -4-(-3) \rangle = \langle 2, -1 \rangle$



13) $\vec{v} - \vec{r} = \langle 8-5, -13-9 \rangle = \langle 3, -22 \rangle$

14) $x = \|\vec{v}\|\cos\theta = \frac{3}{5}\cos 300° = \frac{3}{5}\left(\frac{1}{2}\right) = \frac{3}{10}$

$y = \|\vec{v}\|\sin\theta = \frac{3}{5}\sin 300° = \frac{3}{5}\left(-\frac{\sqrt{3}}{2}\right) = -\frac{3\sqrt{3}}{10}$

$\vec{v} = \frac{3}{10}\vec{i} - \frac{3\sqrt{3}}{10}\vec{j}$

15) $\|\vec{r}\| = \sqrt{1^2 + (-1.3)^2} = \sqrt{1 + 1.69} = \sqrt{2.69} = 1.6$

$\theta = \tan^{-1}\left(\frac{-1.3}{1}\right) = \tan^{-1}(-1.3) = -52.4°$

$\vec{r} = \langle 1, -1.3 \rangle \Rightarrow$ quad IV $\Rightarrow \theta = -52.4°$ or $-52.4° + 360° = 307.6°$

16) $\vec{p} \cdot \vec{q} = \langle 6, 18 \rangle \cdot \langle -3, -9 \rangle = 6(-3) + 18(-9) = -180$

$\vec{p} \cdot \vec{p} = \langle 6, 18 \rangle \cdot \langle 6, 18 \rangle = 6(6) + 18(18) = 360$

$\|\vec{p}\| = \sqrt{360} = 6\sqrt{10}$

$\vec{q} \cdot \vec{q} = \langle -3, -9 \rangle \cdot \langle -3, -9 \rangle = (-3)(-3) + (-9)(-9) = 90$

$\|\vec{q}\| = \sqrt{90} = 3\sqrt{10}$

$\cos\theta = \frac{-180}{6\sqrt{10} \cdot 3\sqrt{10}} = \frac{-180}{180} = -1$

$\theta = \cos^{-1}(-1) = 180° \Rightarrow$ parallel