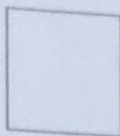


Pre-Calculus; Unit 10 Practice



Target 10A

I can represent, model with, and perform operations on vector quantities.

1. Let \mathbf{v} be a vector from initial point $A(-14,5)$ to terminal point $B(5,-8)$. Write \mathbf{v} in terms of the \mathbf{i} and \mathbf{j} vectors, then write it in component form. (2 pts.)

$$\vec{AB} = \langle 5 - (-14), -8 - 5 \rangle = \underline{\langle 19, -13 \rangle}$$

$$\underline{19\mathbf{i} - 13\mathbf{j}}$$

2. Let $\mathbf{u} = 15\mathbf{i} + 5\mathbf{j}$, $\mathbf{v} = -5\mathbf{i} + 5\mathbf{j}$, and $\mathbf{w} = -5\mathbf{j}$. Find $\mathbf{u} - (2\mathbf{v} + \mathbf{w})$. (2pts.)

$$\vec{u} - (2\vec{v} + \vec{w})$$

$$(15\mathbf{i} + 5\mathbf{j}) - (2(-5\mathbf{i} + 5\mathbf{j}) + (-5\mathbf{j}))$$

$$\underline{25\mathbf{i}}$$

3. Let $\mathbf{u} = \langle -1, 10 \rangle$. Find $|\mathbf{u}|$ and the direction angle of \mathbf{u} . (2pts.)

$$|\mathbf{u}| = \sqrt{(-1)^2 + 10^2} = \sqrt{101}$$

$$|\mathbf{u}| = \underline{\sqrt{101}}$$

$$\theta = \tan^{-1}\left(\frac{10}{-1}\right) = -89 + 180$$

$$\text{Angle} = \underline{95.7^\circ}$$

4. The magnitude and direction of two forces acting on an object are 40 pounds at 57° , and 60 pounds at 112° . Find the magnitude, to the nearest hundredth of a pound, and the direction angle, to the nearest tenth of a degree, of the resultant force. (4pts.)

Magnitude = 89.18 lbs.

Angle = 90.44^\circ

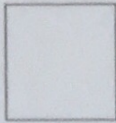
$$+\vec{u} = \langle 40 \cos 57, 40 \sin 57 \rangle$$

$$+\vec{v} = \langle 60 \cos 112, 60 \sin 112 \rangle$$

$$\vec{r} = \underline{\langle -6.908, 89.1779 \rangle}$$

$$|\vec{r}| = \sqrt{(-6.908)^2 + (89.1779)^2} \approx 89.18$$

$$\theta = \tan^{-1}\left(\frac{89.1779}{-6.908}\right) = -89.6^\circ + 180 = 90.44^\circ$$



Target 10B

I can apply the dot product of vectors to solve problems.

5. Let $\mathbf{u} = \langle 5, -14 \rangle$, $\mathbf{v} = \langle 4, 5 \rangle$.

a) Find $\mathbf{u} \cdot \mathbf{v}$ (1 pt.)

$$\mathbf{u} \cdot \mathbf{v} = 5 \cdot 4 + (-14)(5) = \underline{\underline{-50}}$$

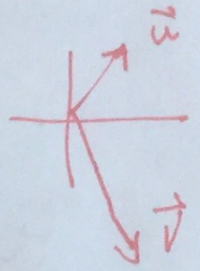
b) Find the angle between \mathbf{u} and \mathbf{v} to the nearest tenth of a degree. (1 pt.)

$$\frac{|\mathbf{u}|}{|\mathbf{v}|} = \frac{\sqrt{221}}{\sqrt{41}} \quad \underline{\underline{121.7^\circ}}$$

c) Find the projection of \mathbf{u} onto \mathbf{v} . (2 pts.)

$$\text{Proj}_{\mathbf{v}} \mathbf{u} = \frac{\mathbf{u} \cdot \mathbf{v}}{|\mathbf{v}|^2} \mathbf{v} = \frac{-50}{41} \langle 4, 5 \rangle$$

$$\left\langle \frac{-200}{41}, \frac{-250}{41} \right\rangle$$

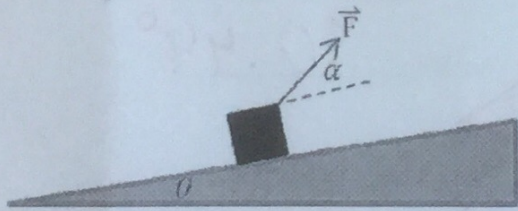


6. Let $\mathbf{u} = \langle -13, 11 \rangle$, $\mathbf{v} = \langle x, -5 \rangle$. Find the value of x that will make \mathbf{u} and \mathbf{v} orthogonal. Defend your answer with your work. (2 pts.)

$$\begin{aligned} -13x + 11(-5) &= 0 \\ -13x - 55 &= 0 \\ x &= \frac{-55}{-13} \end{aligned}$$

$$x = \underline{\underline{\frac{55}{13}}}$$

7. A force \mathbf{F} of 100 pounds on a rope is used to pull a box up a ramp inclined at 13° from the horizontal. The rope forms an angle of 32° with the horizontal.



$$\begin{aligned} &\langle 100 \cos 32, 100 \sin 32 \rangle \\ &\langle 84.8, 52.99 \rangle \end{aligned}$$

a) Find the component form of the force vector. (2 pts.)

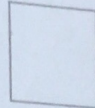
b) Find the amount of work done on the box if it is pulled 28 feet along the ramp. (2 pts.)

$$W = (100)(28) \cos(32-13) =$$

$$\underline{\underline{2647.45 \text{ Foot-Pounds}}}$$

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Target 10D

I can locate points, create graphs, and analyze graphs in the polar coordinate system.

8. What do the two values in a polar coordinate represent? (1 pt.)

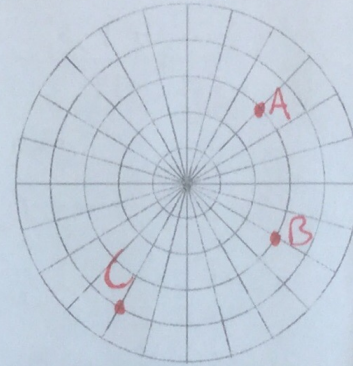
Radius & Angle

9. Graph the following points on the polar grid below. (1 pt. each)

a. $(2, 45^\circ)$

b. $(-3, 150^\circ)$

c. $(4, \frac{-2\pi}{3})$



10. For each of the points graphed above, find one other point that could represent the same point with an opposite r-value. (e.g. If the r-value is 5, find the coordinates of a point with an r-value of -5.) (1 pt. each)

$45 + 180 = 225$ a. $(-2, 225^\circ)$

b. $(3, 330^\circ)$

c. $(4, \frac{\pi}{3})$

11. Find the rectangular coordinates for each point graphed above. Leave your answers in exact form. (1 pt. each)

$(2 \cos 45, 2 \sin 45)$

a. $(\sqrt{2}, \sqrt{2})$

$(-3 \cos 150, -3 \sin 150)$

b. $(\frac{-3\sqrt{3}}{2}, \frac{-3}{2})$

$(4 \cos \frac{-2\pi}{3}, 4 \sin \frac{-2\pi}{3})$

c. $(-2, 2\sqrt{3})$