

8.7 – Required Practice

#1. Show vectors are equivalent:

$$\mathbf{u}: (-4, 0), (1, 8)$$

$$\mathbf{v}: (2, -1), (7, 7)$$

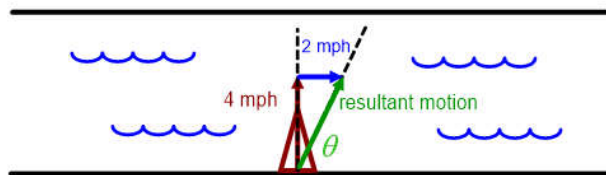
#2. Find the magnitude of each vector and $3\mathbf{v} - 2\mathbf{u}$

Sketch the original vectors and $3\mathbf{v} - 2\mathbf{u}$

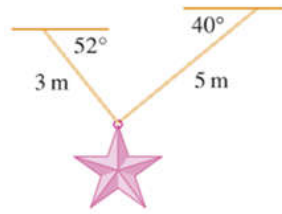
$$\vec{u} = \langle 3, 6 \rangle$$

$$\vec{v} = \langle 5, -2 \rangle$$

#3. A boat heads straight across a river at a speed of 4 mph, but the water in the river is flowing a 2 mph (as in the figure). What is the resultant and direction of the boat?



#4. A star-shaped decoration is suspended, motionless, from two points as shown in the figure. If the decoration weighs 10 lbs, find the tension in each wire (the magnitude of each tension as well as the component forces)?



Show that the vectors \vec{u} and \vec{v} between the given points are equivalent.

#5. $\vec{u}: (3,2) \text{ to } (5,6)$

$\vec{v}: (1,4) \text{ to } (3,8)$

Find the magnitude of the vector.

#6. $\vec{a} = \langle 7, 0 \rangle$

#7. $\vec{a} = \langle 4, 3 \rangle$

#8. $\vec{a} = \langle 6, -5 \rangle$

For the given vectors, find the new vectors: $\frac{2}{3}\vec{a}$, $3\vec{b}$, $\vec{b} - \vec{a}$, $2\vec{a} + 5\vec{b}$.

#9. $\vec{a} = \langle 4, 9 \rangle$

$\vec{b} = \langle 2, -5 \rangle$

For the given vector, find: $\left| \vec{a} \right|$, $\frac{\vec{a}}{\left| \vec{a} \right|}$, $\left| \frac{\vec{a}}{\left| \vec{a} \right|} \right|$.

#10. $\vec{a} = \langle 3, -4 \rangle$

Convert the given vector into its x- and y-components.

#11. $\left| \vec{a} \right| = 3$, $\theta = 60^\circ$

8.8 – Required Practice

#1. Find the domain of the vector-valued function: $\vec{r}(t) = \left\langle \sqrt{4-t^2}, \frac{3}{t-1} \right\rangle$

#2. Find the derivative of $\vec{r}(t) = \left\langle e^{(t^2+3t)}, \frac{\ln(t^2-3t)}{t^3-4} \right\rangle$

#3. Evaluate $\int \vec{r}(t) dt$ if $\vec{r}(t) = \langle \cos t, t^3 - t \rangle$

Find the domain of the vector-valued function.

#4. $\vec{r}(t) = \left\langle \frac{1}{t+1}, \frac{t}{2} \right\rangle$

#5. $\vec{r}(t) = \langle \ln(t), -e^t \rangle$

For the vector-valued function $\vec{r}(t) = \left\langle \frac{1}{2}t^2, -t+1 \right\rangle$ evaluate at its indicated input value.

#6. $\vec{r}(1)$

#7. $\vec{r}(2+\Delta t)$

Sketch the plane curve for the given vector-valued function (with direction arrows).

#8. $\vec{r}(t) = \left\langle \frac{1}{4}t, t-1 \right\rangle$

#9. $\vec{r}(t) = \langle t^3, t^2 \rangle$

Sketch the plane curve for the given vector-valued function (with direction arrows).

#10. $\vec{r}(t) = \langle 2\cos(t), 2\sin(t) \rangle$

Find $\vec{r}'(t)$ then $\vec{r}(2)$ and $\vec{r}'(2)$. Then sketch the plane curve, and add the vectors to your sketch $\vec{r}(2)$ and $\vec{r}'(2)$.

#11. $\vec{r}(t) = \langle 2\cos(t), 2\sin(t) \rangle$

8.9 – Required Practice

#1. $\vec{r}(t) = \langle t^3 + 2\cos t, \sin t - t^2 \rangle$

Find $\vec{v}(t)$, $\vec{a}(t)$

#2. $\vec{a}(t) = \langle t, -10 \rangle$, $\vec{v}(2) = \langle 5, 2 \rangle$, $\vec{r}(1) = \langle 3, 4 \rangle$

Find $\vec{v}(t)$, $\vec{r}(t)$, $\vec{r}(3)$

#3. $\vec{a}(t) = \langle 2, 2t \rangle$, $\vec{v}(1) = \langle 3, 5 \rangle$, $\vec{r}(1) = \langle 2, 6 \rangle$

Find $\vec{v}(t)$, $\vec{r}(t)$, $\vec{r}(2)$ and total distance traveled from $t = 0$ to $t = 2$

Position vector $\vec{r}(t)$ represents the path of an object moving on a plane.

(a) Find $\vec{v}(t)$, $\vec{a}(t)$ and the speed of the object at time t .

(b) Evaluate the position, velocity, and acceleration vectors at the given time.

(c) Sketch the path of the object and add the position, velocity, and acceleration vectors at the given time to your sketch.

#4. $\vec{r}(t) = \langle 3t, t-1 \rangle$ at $t=1$

#5. $\vec{r}(t) = \langle t^2, t \rangle$ at $t=2$

Position vector $\vec{r}(t)$ represents the path of an object moving on a plane.

(a) Find $\vec{v}(t)$, $\vec{a}(t)$ and the speed of the object at time t .

(b) Evaluate the position, velocity, and acceleration vectors at the given time.

(c) Sketch the path of the object and add the position, velocity, and acceleration vectors at the given time to your sketch.

#6. $\vec{r}(t) = \langle 2\cos(t), 2\sin(t) \rangle$ at $t = \frac{\pi}{4}$

The velocity vector and the position of a particle at time $t = 0$ are given.

- (a) Find the position of the particle at time $t = 3$.
- (b) Find the total distance traveled by the particle from $0 \leq t \leq 3$.
- (c) Find the position vector for any time t .
- (d) Find the displacement of the particle from $0 \leq t \leq 3$.

#7. $\vec{v}(t) = \langle 3t^2, 2t \rangle$, $\vec{r}(0) = \langle 1, 2 \rangle$

Use the given information to find the velocity and position vectors. Then find the position at time $t = 2$.

#8. $\vec{a}(t) = \langle 4t, t^2 \rangle$, $\vec{v}(0) = \langle 5, 0 \rangle$, $\vec{r}(0) = \langle 4, 2 \rangle$

Unit 8 Part 3 Test Review

Given vectors $\vec{a} = \langle -3, 6 \rangle$, $\vec{b} = \langle 2, -3 \rangle$, $\vec{c} = \langle 1, 5 \rangle$

#1. Find $2\vec{a} - 3\vec{b} + 5\vec{c}$

#2. Find $\left| \vec{b} \right|$

Given position vector $\vec{r}(t) = \langle 5t^2 - t, e^t + \sin(2t) \rangle$

#3. Find $\vec{r}(-2)$

#4. Find $\vec{r}(2m - 3n)$

For the position vector $\vec{r}(t) = \langle 3\sin(t), 2\cos(t) \rangle$

#4. Find $\vec{v}(t)$

#5. Find $\vec{r}\left(\frac{2\pi}{3}\right)$ and $\vec{v}\left(\frac{2\pi}{3}\right)$

#6. Sketch the plane curve for $\vec{r}(t)$ and add to your sketch the vectors $\vec{r}\left(\frac{2\pi}{3}\right)$ and $\vec{v}\left(\frac{2\pi}{3}\right)$

#7. An object is moving in the xy -plane with a velocity vector given by $\vec{v}(t) = \langle 3t^2 - 4t, 2t - 4 \rangle$. The position of the object at time $t=1$ is $(0, -3)$. In this problem, distance is in meters and time is in seconds.

- (a) Find the position of the object at time $t=2$
- (b) Find the acceleration vector of the object as a function of t .
- (c) For what time(s), $-1 < t < 3$ is the tangent line to the object's path horizontal?
- (d) For what time(s), $-1 < t < 3$ is the tangent line to the object's path vertical?
- (e) For what time(s), $-1 < t < 3$ is the object at rest?
- (f) For what time(s), $-1 < t < 3$ is the tangent line to the object's path have a slope of -2 ?
- (g) For what time(s), $-1 < t < 3$ is the speed of the object $4 \frac{m}{s}$?
- (h) At $t=1$ is the object moving up or down? Explain.
- (i) At $t=1$ is the object moving right or left? Explain.