AP Calculus BC Name: ______________________________

9.6 Worksheet Period: ____________

Show that **u** and **v** are equivalent.

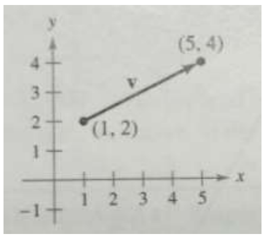
1. **u** : (3,2), (5,6)

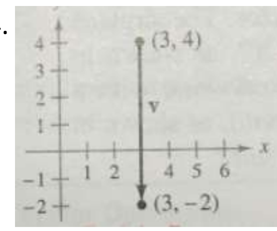
   v = (1,4), (3,8)

2. **u** = (-4,0), (1,8)

   v = (2,-1), (7,7)

Find the component form of the vector **v** and sketch the vector with its initial point at the origin.

3. 

4. 

Find the magnitude of the vector **v**.

5. **v** = <7, 0>

6. **v** = <-3, 0>

7. **v** = <4, 3>

8. **v** = <12, -5>

9. **v** = <6, -5>

10. **v** = <-10, 3>

Perform the following operations on the vectors: 2/3**u**, 3**v**, **v** – **u**, 2**u** + 5**v**.

11. **u** = <4, 9>

    v = <2, -5>

12. **u** = <-3, -8>

    v = <8, 25>

Find the following: $\|\boldsymbol{u}\|, \|\boldsymbol{v}\|, \|\boldsymbol{u}+\boldsymbol{v}\|, \left\|\frac{\boldsymbol{u}}{\|\boldsymbol{u}\|}\right\|, \left\|\frac{\boldsymbol{v}}{\|\boldsymbol{v}\|}\right\|, \left\|\frac{\boldsymbol{u}+\boldsymbol{v}}{\|\boldsymbol{u}+\boldsymbol{v}\|}\right\|$

13. **u** = <1, -1>

    v = <-1, 2>

14. **u** = <0, 1>

    v = <3, -3>

Find the vector **v**, given its magnitude and direction.

15. $\|\boldsymbol{v}\| = 3, \theta = 45°$

16. $\|\boldsymbol{v}\| = 2, \theta = 150°$

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9.7 Worksheet Period: ___________

Find the domain of the vector-valued function.

1. $\boldsymbol{r}(t) = \langle \frac{1}{t+1}, \frac{t}{2} \rangle$

2. $\boldsymbol{r}(t) = \langle \sqrt{4-t^2}, t^2 \rangle$

3. $\boldsymbol{r}(t) = \langle \ln(t), -e^t \rangle$

4. $\boldsymbol{r}(t) = \langle \sin(t), \cos(t) \rangle$

Evaluate (if possible) the vector-valued function at each given time t.

5. $\boldsymbol{r}(t) = \langle \frac{1}{2}t^2, -t+1 \rangle$

a. **r**(1) =

b. **r**(0) =

c. **r**(s + 1) =

d. **r**(2 + Δt) – **r**(2) =

6. Match the equation with its graph.

$\boldsymbol{r}(t) = \langle 3t, 2t-1 \rangle$ $\boldsymbol{r}(t) = \langle 2t^3, -t^2 \rangle$ $\boldsymbol{r}(t) = \langle \cos(t), \sin(t) \rangle$ $\boldsymbol{r}(t) = \langle 4\cos(t), \sin(t) \rangle$

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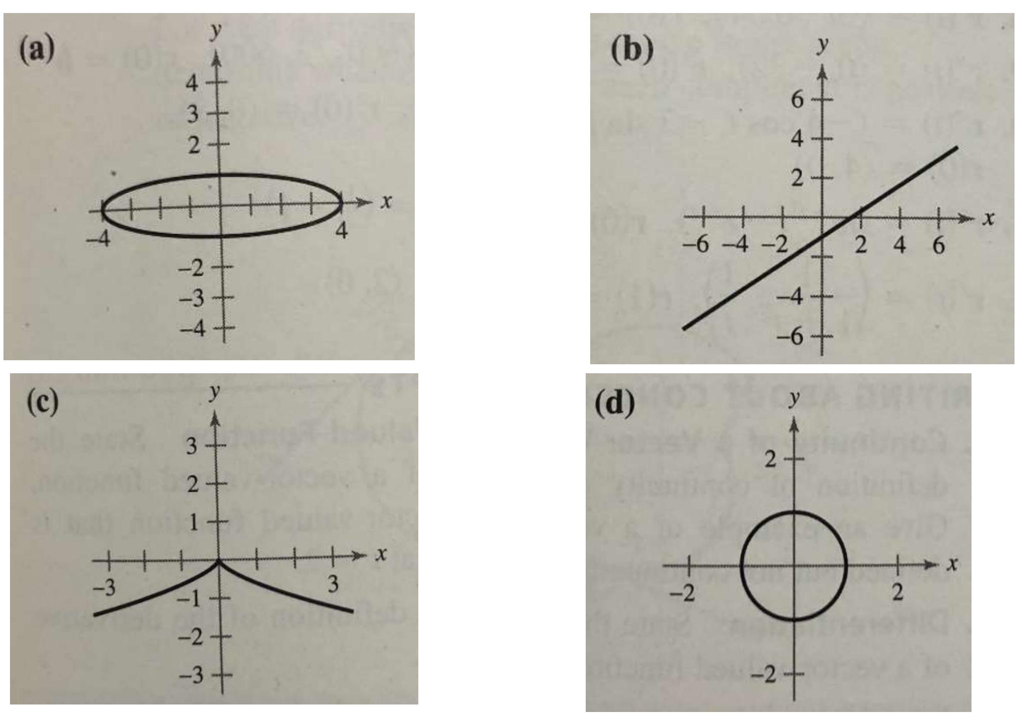

Sketch the plane curve represented by the vector-valued function and give the orientation of the curve.

7. $\boldsymbol{r}(t) = \langle \frac{t}{4}, t-1 \rangle$

8. $\boldsymbol{r}(t) = \langle 5-t, \sqrt{t} \rangle$

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

10. $\langle t^2+t, t^2-t \rangle$

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

12. $\langle \cos(t), 3\sin(t) \rangle$

Find **r**'(t), **r**(t_0) and **r**'(t_0). Then sketch the plane curve represented by **r**(t) and sketch the vectors **r**(t_0) and **r**'(t_0). Position the vectors such that the initial point of **r**(t_0) is at the origin, and the initial point of **r**'(t_0) is at the terminal point of **r**'(t_0).

13. $\boldsymbol{r}(t) = \langle t^2, t \rangle, t_0 = 2$

14. $\boldsymbol{r}(t) = \langle \cos(t), \sin(t) \rangle, t_0 = \frac{\pi}{2}$

AP Calculus BC

Name: ________________________________

9.8 Worksheet

Period: ____________

r(t) represents the path of an object moving on a plane.

(a) Find the velocity vector, speed, and acceleration vector of the object.

(b) Evaluate the velocity vector and acceleration vector of the object at the given value of t.

(c) Sketch the graph of the path, and sketch the velocity and acceleration vectors at the given value of t.

1. $\boldsymbol{r}(t) = \langle 3t, t-1\rangle, t = 1$

2. $\boldsymbol{r}(t) = \langle t, -t^2+4\rangle, t = 1$

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

4. $\boldsymbol{r}(t) = \langle \frac{1}{4}t^3+1, t\rangle, t = 2$

5. $\boldsymbol{r}(t) = \langle 2\cos(t), 2\sin(t) \rangle, t = \frac{\pi}{4}$

6. $\boldsymbol{r}(t) = \langle t - \sin(t), 1 - \cos(t) \rangle, t = \pi$

The velocity vector **v**(t) 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 travelled on the interval 0 ≤ t ≤ 3.

(c) Find the position vector of the particle.

7. $\boldsymbol{v}(t) = \langle 3,1 \rangle, (4,5)$

8. $\boldsymbol{v}(t) = \langle 4,10 \rangle, (3,1)$

9. $\boldsymbol{v}(t) = \langle 3t^2, 2t\rangle, (1,2)$

10. $\boldsymbol{v}(t) = \langle 8t - 1, 6t^2 + 1\rangle, (4,0)$

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

11. $\boldsymbol{a}(t) = \langle 2,3\rangle, \boldsymbol{v}(0) = \langle 0,4\rangle, \boldsymbol{r}(0) = \langle 0,0\rangle$

12. $\boldsymbol{a}(t) = \langle t, t\rangle, \boldsymbol{v}(0) = \langle 3,1\rangle, \boldsymbol{r}(0) = \langle 1,5\rangle$

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

14. $\boldsymbol{a}(t) = \langle t, \sin(t)\rangle, \boldsymbol{v}(0) = \langle 0, -1\rangle, \boldsymbol{r}(0) = \langle 0,0\rangle$