Review for Test on Polar/Parametric/Vectiors Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find dy/dx in terms of t.

1) $x = 2\cot t, y = 3\csc t$ 1) _____

A) $-\frac{2}{3}\csc t$ B) $-\frac{2}{3}\cos t$ C) $\frac{3}{2}\cos t$ D) $\frac{3}{2}\cot t$

Determine analytically at the given value of t whether the parametric curve is increasing, decreasing, or neither.

2) $x = 5t^2 + t, y = t^2 - 10t + 3, t = 1$ 2) _____

A) Increasing B) Neither C) Decreasing

Solve the problem.

3) Find the points at which the tangent to the curve $x = -5 + \sin t, y = 4 + \cos t$ is horizontal. 3) _____

A) (0, 1) and (0, –1) B) (0, 5) and $(\pi, 3)$

C) (–5, 5) and (–5, 3) D) (–5, 4)

Find d^2y/dx^2 in terms of t.

4) $x = 5\sin t, y = 4\cos t$ 4) _____

A) $\frac{4}{5}\cot t$ B) $-\frac{4}{5}\sec^3 t$ C) $-\frac{4}{25}\sec t$ D) $-\frac{4}{25}\sec^3 t$

Determine analytically at the given value of t whether the parametric curve is concave up, concave down, or neither.

5) $x = \frac{t^2}{2} + 9t, y = \frac{t^2}{2} - 2t, t = 2$ 5) _____

A) Concave up B) Concave down C) Neither

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find the length of the curve.

6) $x = \ln(\csc t + \cot t) - \cos t, y = \sin t, \pi/4 \le t \le \pi/2$ 6) _____

7) $x = \frac{1}{3}t^3, y = 5t^2, 0 \le t \le 2$ 7) _____

Find the component form of the vector with the given magnitude that forms the given directional angle with the positive x-axis.

8) 20, $\pi/6$ 8) _____

Find the component form of the specified vector.

9) the vector from the point A = (9, 7) to the origin 9) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the indicated vector in component form.

10) Let $\mathbf{u} = \langle -4, 3\rangle$, $\mathbf{v} = \langle -8, -1\rangle$. Find $\mathbf{u} - 6\mathbf{v}$. 10) _____

A) $\langle 44, 9\rangle$ B) $\langle -52, -3\rangle$ C) $\langle -12, -12\rangle$ D) $\langle -1, 54\rangle$

If r(t) is the position vector of a particle in the plane at time t, find the particle's speed at the given value of t.

11) $\mathbf{r}(t) = \langle 2 \ln (7t), 5t^3\rangle$, $t = 2$ 11) _____

A) $\sqrt{61}$ B) $\sqrt{54{,}015}$ C) $\sqrt{3601}$ D) 3601

particle moves in the plane with the given position vector. Find the velocity or acceleration vector, as indicated, at the specified time.

12) $\mathbf{r}(t) = \langle 5t + 6, -e^{-7t}\rangle$. Find the velocity vector at time $t = 3$. 12) _____

A) $\langle 5, -e^{-21}\rangle$ B) $\langle 6, 7e^{-21}\rangle$ C) $\langle 5, -7e^{-21}\rangle$ D) $\langle 5, 7e^{-21}\rangle$

Solve the problem.

13) The path of a particle is given by $\mathbf{r}(t) = \langle 9t - 3t^2, t^3 - 9t\rangle$. Find the coordinates of each point on the path where the horizontal component of the velocity of the particle is zero. 13) _____

A) (0, 0) and (0, 0.0000) B) (0, 6.750)

C) (1.500, 1.732) and (1.500, -1.732) D) (6.750, -10.12)

14) A particle moves in the plane so that its position at any time $t \geq 0$ is given by 14) _____

$$x = 2(e^t + e^{-t}),\ y = \frac{7}{2}(e^t - e^{-t})$$

Eliminate the parameter and find an equation in terms of x and y for the path of the particle.

A) $\frac{x^2}{16} - \frac{y^2}{49} = 1$ B) $\frac{x^2}{16} + \frac{y^2}{49} = 1$ C) $\frac{x^2}{4} - \frac{y^2}{7} = 1$ D) $\frac{y^2}{49} - \frac{x^2}{16} = 1$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

The velocity v(t) of a particle moving in the plane is given, along with the position of the particle at time t = 0. Find the position of the particle at time $t = t_1$.

15) $v(t) = \langle 15t^2 - 10t, 4 + \cos \pi t \rangle$, initial position $= \langle 1, 2 \rangle$, $t_1 = 3$ 15) _____

Solve the problem.

16) The velocity v(t) of a particle moving in the plane is given by the vector $\langle 3\pi \cos 2t, 5\pi \sin 4t \rangle$. Find the distance traveled by the particle from t = 0 to t = 5. 16) _____

17) The position of a particle in the plane at time t is given by $\mathbf{r}(t) = \langle 4t + \cos t, 6t + \sin t \rangle$. Find an expression that represents the distance the particle travels from time t = 0 to t = 5. 17) _____

Change the given polar coordinates (r, θ) to rectangular coordinates (x, y).

18) $\left(6, \frac{5\pi}{6}\right)$ 18) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find two sets of polar coordinates for the point with the given rectangular coordinates.

19) $(-9\sqrt{3}, 9)$ 19) _____

Find two pairs of polar coordinates each with $-\pi < \theta \leq \pi$.

A) $\left(9, \frac{5\pi}{6}\right)$ and $\left(9, -\frac{\pi}{6}\right)$

B) $\left(18, \frac{5\pi}{6}\right)$ and $\left(-18, -\frac{\pi}{6}\right)$

C) $\left(-18, \frac{5\pi}{6}\right)$ and $\left(18, -\frac{\pi}{6}\right)$

D) $\left(18, \frac{2\pi}{3}\right)$ and $\left(-18, -\frac{\pi}{3}\right)$

Describe the graph of the polar equation.

20) $r^2 = 32r \cos \theta$ 20) _____

A) Circle of radius 16 and center (0, 16)

B) Horizontal line passing through (0, 32)

C) Circle of radius 16 and center (16, 0)

D) Vertical line passing through (32, 0)

21) $r \cos \theta = 11$ 21) _____

A) Vertical line through (11, 0)
B) Circle centered at origin with radius 11
C) Line with slope 11 passing through the origin
D) Horizontal line through (0, 11)

Find the slope of the polar curve at the indicated point.

22) $r = 3 + 6 \cos \theta, \theta = \frac{\pi}{2}$ 22) _____

A) 2 B) $-\frac{1}{2}$ C) -2 D) $\frac{1}{2}$

Find the area of the specified region.

23) inside the limacon $r = 6 + 2 \sin \theta$ 23) _____

A) 76π B) $76\pi - 24$ C) 38π D) $38\pi + 24$

24) inside the lemniscate $r^2 = 6 \sin 2\theta$ and outside the circle $r = \sqrt{3}$ 24) _____

A) $3\sqrt{3} - \pi + 6$ B) 2π C) $\frac{1}{3}(2\pi + 3\sqrt{3})$ D) $3\sqrt{3} - \pi$

25) inside one loop of the lemniscate $r^2 = 4 \cos 2\theta$ 25) _____

A) 1 B) 4 C) 2 D) 8