Math 122 - #28
Parametric Equations

1. Eliminate the parameter and find the corresponding rectangular equation: $x = 3t^2$ and $y = 2t + 1$.

2. Eliminate the parameter and find the corresponding rectangular equation: $x = 1 + \sec\theta$ and $y = 2 + \tan\theta$.

Sketch the curve represented by the parametric equations (indicate the direction of the curve). Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.

3. $x = 3t - 1, \quad y = 2t + 1$

4. $x = \sqrt[3]{t}, \quad y = 1 - t$

5. $x = \cos t, \quad y = 3\sin t$

6. $x = \sec t, \quad y = \cos t$

Find the arc length of the given curve on the indicated interval:

7. $x = t^2 \qquad y = 2t^2 - 1 \qquad 1 \le t \le 4.$

8. $x = e^{-t}\cos t, \quad y = e^{-t}\sin t, \quad 0 \le t \le \pi/2$

9. $x = t^2, \quad y = 4t^3 - 1, \quad -1 \le t \le 1$

Find the speed s at time t for:

10. $c(t) = (3\cos 5t, 8\cos 5t)$ at $t = \frac{\pi}{4}$

11. $c(t) = (\ln(t^2 + 1), t^3)$ at $t = 1$

Answers

1. $3y^2 - 4x - 6y + 3 = 0$

2. $x^2 - y^2 - 2x + 4y - 4 = 0$

3. $\dfrac{dy}{dx} = \dfrac{2}{3} \qquad \dfrac{d^2y}{dx^2} = 0$

4. $\dfrac{dy}{dx} = -3t^{2/3} \qquad \dfrac{d^2y}{dx^2} = -6t^{1/3}$

5. $\dfrac{dy}{dx} = -3\cot t \qquad \dfrac{d^2y}{dx^2} = -3\csc^3 t$

6. $\dfrac{dy}{dx} = -\cos^2 t \qquad \dfrac{d^2y}{dx^2} = 2\cos^3 t$

7. $15\sqrt{5}$

8. $\sqrt{2}(1 - e^{-\pi/2})$

9. $\dfrac{1}{27}(37\sqrt{37} - 1)$

10. 30.21

11. 3.16