

## Parametric Curves and Calculus- HW Problems

Find  $\frac{dy}{dx}$ .

1.  $x = \cos^3(t)$   
 $y = \sin^3(t)$

2.  $x = te^{-t}$   
 $y = t^2 + t$

Find an equation of the tangent line to the curve at the given point.

3.  $x = \cos^3(t)$        $t = \frac{\pi}{3}$   
 $y = \sin^3(t)$

4.  $x = \sin(2t)$        $t = \frac{\pi}{3}$   
 $y = 2 \sin(t)$

Find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$ .

5.  $x = t^2 + 2t$   
 $y = t^2 - 1$

6.  $x = te^{-t}$   
 $y = e^t$

Find the points on the curve where the tangent line is horizontal or vertical.

7.  $x = 2 - t$

$$y = t^3 - 3t$$

8.  $x = t^4 - 2t^2$

$$y = t^2 + t + 1$$

9.  $x = 2 \cos(\theta)$        $0 \leq \theta \leq 2\pi$

$$y = 4 \sin(\theta)$$

Find the area enclosed by the  $x$ -axis and the following curves.

10.  $x = t^2 + t$        $0 \leq t \leq 4$

$$y = t^2 - 4t.$$

11.  $x = \sqrt{t}$        $0 \leq t \leq 2$

$$y = t^2 - 2t.$$

Find the length of the following curves.

$$12. \quad \begin{aligned} x &= 2 + 3t^2 & 0 \leq t \leq 2 \\ y &= 3 + 2t^3 \end{aligned}$$

$$13. \quad \begin{aligned} x &= \cos^3(\theta) & 0 \leq \theta \leq 2\pi \\ y &= \sin^3(\theta) \end{aligned}$$

$$14. \quad \begin{aligned} x &= \cos(t) + t\sin(t) & 0 \leq t \leq 2\pi \\ y &= \sin(t) - t\cos(t) \end{aligned}$$

$$15. \quad \begin{aligned} x &= e^t \cos(t) & 1 \leq t \leq 2 \\ y &= e^t \sin(t) \end{aligned}$$

$$16. \quad \begin{aligned} x &= 3 + 2t & 0 \leq t \leq 2 \\ y &= e^t + e^{-t} \end{aligned}$$