Name: ____________________ Parametric and Polar Practice

Tangents with Parametric Equations

For problems 1 and 2 compute $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for the given set of parametric equations.

1. $x = 4t^3 - t^2 + 7t \qquad y = t^4 - 6$

2. $x = \mathbf{e}^{-7t} + 2 \qquad y = 6\mathbf{e}^{2t} + \mathbf{e}^{-3t} - 4t$

For problems 3 and 4 find the equation of the tangent line(s) to the given set of parametric equations at the given point.

3. $x = 2\cos(3t) - 4\sin(3t) \qquad y = 3\tan(6t)$ at $t = \frac{\pi}{2}$

4. $x = t^2 - 2t - 11 \qquad y = t(t-4)^3 - 3t^2(t-4)^2 + 7$ at $(-3, 7)$

5. Find the values of t that will have horizontal or vertical tangent lines for the following set of parametric equations.

$$x = t^5 - 7t^4 - 3t^3 \qquad y = 2\cos(3t) + 4t$$

Arc Length with Parametric Equations

For all the problems in this section you should only use the given parametric equations to determine the answer.

For problems 1 and 2 determine the length of the parametric curve given by the set of parametric equations. For these problems you may assume that the curve traces out exactly once for the given range of t's.

1. $x = 8t^{\frac{3}{2}} \qquad y = 3 + (8-t)^{\frac{3}{2}} \qquad 0 \le t \le 4$

2. $x = 3t + 1 \qquad y = 4 - t^2 \qquad -2 \le t \le 0$

Tangents with Polar Coordinates

1. Find the tangent line to $r = \sin(4\theta)\cos(\theta)$ at $\theta = \frac{\pi}{6}$.

2. Find the tangent line to $r = \theta - \cos(\theta)$ at $\theta = \frac{3\pi}{4}$.

Arc Length with Polar Coordinates

1. Determine the length of the following polar curve. You may assume that the curve traces out exactly once for the given range of θ.

$$r = -4\sin\theta\ ,\ 0 \le \theta \le \pi$$

For problems 2 and 3 set up, but do not evaluate, an integral that gives the length of the given polar curve. For these problems you may assume that the curve traces out exactly once for the given range of θ.

2. $r = \theta\cos\theta\ ,\ 0 \le \theta \le \pi$

3. $r = \cos\left(2\theta\right) + \sin\left(3\theta\right)\ ,\ 0 \le \theta \le 2\pi$