

CHAPTER 10: PARAMETRIC CURVES AND POLAR CURVES

MATH 2019 – SPRING 2008

1. Consider the curve described by the parametric equations

$$x = 2t^3 - 3t^2 - 36t + 1, \quad y = t^4 - 8t^2 - 5$$

- (a) Find all points of horizontal and vertical tangency to the curve.
(b) Find the slope and concavity of the curve at $t = 1$.
2. You should be able to recognize the equations of limaçons (cardioid, with loop, etc.), roses, circles, and lemniscates, and you should be able to sketch their graphs.

3. (a) Find the arc length of the curve described by the parametric equations

$$x = 2t^2 \quad y = (4t + 9)^{3/2} \quad 0 \leq t \leq 1$$

- (b) Find the arc length of the polar function over the indicated interval.

$$r = \cos^3(\theta/3) \quad 0 \leq \theta \leq 3\pi$$

4. Find the slope of the polar curve at $\theta = \pi/4$

$$r = 3 - 3 \cos \theta$$

5. (a) Find the area inside one petal of $r = 4 \cos 7\theta$.
(b) Find the area of the region inside $r = 2 \sin 6\theta$ and outside $r = \sqrt{2}$.
(c) Find the area inside the inner loop of $r = 1 + 2 \sin \theta$.
(d) Find the area of the region inside $r = 3 \cos \theta$ and outside $r = 1 + \cos \theta$.
(e) Find the area of the region inside $r = 1 + \cos \theta$ and outside $r = 3 \cos \theta$.

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