

Math 231: Calculus 2
Exam 3
August 1, 2007

Name: _____

1) (10 points) Find all points of intersection of the parametric curves

$$x(t) = t^3 + t \qquad y(t) = 7t$$

and

$$x(s) = \frac{s^2}{196} + 1 \qquad y(s) = \frac{s}{2}.$$

2) (5 points) Sketch the parametric curve $x(t) = 1 - \sin^2(t)$ and $y(t) = \cos^4(t)$.

3) (5 points) Find a polar equation for the parabola with the origin as its focus and directrix $y = -3$.

4) (5 points) Find the eccentricity and directrix of the conic section $r = -3/(2 \cos(\theta) - 2)$. What kind of conic section is it?

5) (20 points) a) Find the area bounded by the parametric curve

$$x(t) = 2 \cos(\theta) + 3 \qquad y(t) = \sin(\theta) + 3.$$

b) Set up but do not evaluate the integral giving the arc length of the curve from part (a).

c) Set up but do not evaluate the integral giving the surface area gotten by revolving the curve from part (a) around the line $x = -1$.

6) (35 points) Let C_1 be the polar curve $r = \sin(2\theta)$ and C_2 be the polar curve $r = \cos(\theta)$.

a) Sketch C_1 and C_2 .

b) Find the slope of the tangent line to C_1 at $\pi/3$.

6 cont.) c) Find the area inside both C_1 and C_2 .

7) (20 points) Find the horizontal and vertical components of velocity as well as the speed of the parametric curve

$$x(t) = 2 \cos(2t) + \sin(5t) \qquad y(t) = 2 \sin(2t) + \cos(5t)$$

at the point $t = \pi/2$.