Math 2414 **Homework Set 4** **10 Points**

Arc Length

For problems 1 & 2 find the length of the given curve.

1. $x = 1 + 2y^2,\ 1 \le x \le 9$ Assume that $y \ge 0$ for this problem.

2. $y = \ln\left(1 - x^2\right),\ 0 \le x \le \frac{1}{2}$

3. Set up, but do not evaluate an integral that will give the length of the following curve. Yes, I realize that there are no limits given, you will need to determine them. I also realize that this function is not given in the same form as the previous two, dealing with that is part of the problem.

$$4x^2 + \frac{y^2}{4} = 1$$

Surface Area

For problems 4 & 5 find the surface area of the region obtained by rotating the function about the given axis.

4. $y = 2 + \frac{3}{2}x^2,\ -1 \le x \le 2$ about the *y*-axis.

5. $y = \sqrt{4x - x^2}\ ,\ 1 \le x \le 3$ about the *x*-axis.

6. Set up, but do not evaluate, the integral that will give the surface area obtained by rotating $x = \mathbf{e}^{-y^2}$, $-1 \le y \le 1$ about,

(a) the *x*-axis.

(b) the *y*-axis.

Parametric Equations and Curves

For problems 7 & 8 do each of the following.

(a) Eliminate the parameter for the parametric equations and sketch the parametric curve clearly indicating the direction in which the curve is traced out as *t* increases.

(b) Determine what (if any) limits exist on the values of *x* and *y*.

(c) If the curve is traced out more than once give a range of *t*'s for which the curve is traced out exactly once. Tracing out a curve exactly once means that no portion of the curve will be retraced (in either direction) in the range of *t*'s given.

7. $x = t^2 - 4t + 1,\ \ y = 2 - t$

8. $x = 2\cos\left(\frac{1}{3}t\right),\ \ y = \sqrt{1 + 4\sin^2\left(\frac{1}{3}t\right)}$

Continued on Back $\Rightarrow$

For problems 9 & 10 suppose that a particle is tracing out a path given by the following parametric equations. Completely describe the motion of the particle as *t* varies in the given interval. This means that you need to do **(a) – (c)** from the previous problems above as well as,

(d) If any portion of the curve is retraced determine how many times the path is traced out.

9. $x = \ln(t),\ y = \ln(t^2),\ 3 \le t \le 10$

10. $x = 4 - 2\cos^2(4t),\ y = 2\sin(4t),\ -3\pi \le t \le 20\pi$