Arc Length

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

1. $y=\left(2x+3\right)^{\frac{3}{2}}-1,\ 0\le x\le 2$

2. $x=1+\left(y+1\right)^{2},\ 1\le x\le 5$ For purposes of dealing with limits you may assume that $y\ge -1$ for this problem.

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.

$$9x^2+\frac{y^2}{36}=1$$

Surface Area

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

4. $y=4-2x^2,\ 0\le x\le 6$ about the *y*-axis.

5. $y=\sin\left(3x\right),\ 0\le x\le \pi$ about the *x*-axis.

6. Set up, but do not evaluate, the integral that will give the surface area obtained by rotating $x=y^2\mathbf{e}^{7y}$ $0\le y\le 1$ 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. $x=t^2+2t,\ \ y=4-t$

8. $x=6\sin\left(3t\right),\ \ y=\sqrt{2+2\cos^2\left(3t\right)}$

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. $x = \ln\left(t^2\right),\ y = \dfrac{1}{\left[\ln\left(t\right)\right]^2},\ 2 \le t \le 10$

10. $x = 4 - 2\cos\left(\frac{t}{4}\right),\ y = 6 + 4\sin^2\left(\frac{t}{4}\right),\ -32\pi \le t \le 80\pi$