

Math 231/199: Calculus 2 Merit

Worksheet 19

November 15, 2007

- (1) Find the arc length of the given parametric curves:

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

$$x = t \cos(t) \quad y = t \sin(t) \quad -\pi \leq t \leq \pi$$

$$x = 2t \quad y = e^t + e^{-t} \quad 0 \leq t \leq 1$$

$$x = \frac{\sin(2t)}{2} \quad y = \sin^2(t) \quad 0 \leq t \leq \pi$$

(2) Draw a picture demonstrating the formula

$$\text{Surface Area} = \int (\text{radius})(\text{arc length}) dt.$$

(3) Sketch the parametric equation

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

Then determine the surface areas obtained by rotating the curve around the lines $x = 0$ and $x = 10$.

(4) Sketch the parametric equation

$$x = 2t \quad y = e^t + e^{-t} \quad 0 \leq t \leq 1.$$

Then determine the surface areas obtained by rotating the curve around the lines $y = 0$ and $y = 10$.

(5) An 8-foot ladder stands vertically against a wall. The bottom is pulled away from the wall while the top remains in contact with the wall. Find the distance travelled by the midpoint of the ladder.

(6) A cycloid is the curve traced out by a point on a wheel as the wheel rolls along the x -axis. Write an equation for the cycloid traced by the point on a wheel with radius 1 which starts at $(0, 2)$. Find the distance travelled by this point during one rotation of the wheel.