

## Worksheet

For each problem construct an integral which solves the given problem.

### Polar Area

1. Find the area enclosed in one loop of the four-leaf rose given by  $r = 3 \sin 2\theta$
2. Find the area enclosed in one loop of the three-leaf rose given by  $r = 5 \sin 3\theta$
3. Find the area the region which is inside the circle  $r = 4 \cos \theta$  but outside the circle  $r = 2$

### Arc Length

1. Find the length of the curve given by  $y = f(x) = \frac{1}{3}(2 + x^2)^{3/2} + 1$  where  $0 \leq x \leq 3$ .  
Simplify the integrand, where possible.
2. Find the length of the curve given by  $y = f(x) = \frac{1}{3}x^3 + \frac{1}{4}x^{-1}$  where  $1 \leq x \leq 4$ .  
Simplify the integrand where possible.
3. Find the length of the curve  $x^3 = y^2$  from the point (0,0) to the point (4,8)

### Surface Area

1. Find the surface area of the surface generated by revolving the arc given by  $y = f(x) = \frac{2}{3}x^{3/2} + 1$ ,  $0 \leq x \leq 4$ , about
  - A.  $x$ -axis
  - B.  $y$ -axis
2. Find the surface area of the surface generated by revolving the arc given by  $y = f(x) = 4 - x^2$ ,  $0 \leq x \leq 2$ , about
  - A.  $x$ -axis
  - B.  $y$ -axis
  - C. Line  $x = -3$
  - D. Line  $y = 6$