

5. Suppose $r = f(\theta)$ satisfies the differential equation $(\frac{dr}{d\theta})^2 + r^2 = \theta^2$. Compute the arc length of f from $\theta = 0$ to $\theta = 2\pi$.
6. In honor of St. Patrick's Day, you decide to pick a shamrock. Unfortunately, you can't find any three leaf clovers, which makes you sad. Your friend offers to cheer you up by conjuring up one in the form of the polar equation $r = 4 \cos(3\theta)$. With that in mind, compute the area of a single leaf.
7. Also, write down (but do not evaluate) a definite integral to compute the perimeter of one leaf.
8. Consider the region, Ω , in the first quadrant bounded by the x-axis, the y-axis, the line $x + y = 10$, and the circle $x^2 + y^2 = 4$. Give inequalities on r and θ that describe Ω .