

MA 114 Worksheet # 25: Calculus with Polar Coordinates

1. Conceptual Understanding:
 - (a) Give the formula for the area of region bounded by the polar curve $r = f(\theta)$ from $\theta = a$ to $\theta = b$. Give a geometric explanation of this formula.
 - (b) Give the formula for the length of the polar curve $r = f(\theta)$ from $\theta = a$ to $\theta = b$. Explain how to derive this formula by regarding θ as a parameter and writing parametric equations for x and y .
 - (c) Use these formulas to establish the formulas for the area and circumference of a circle.
2. Find the slope of the tangent line to the polar curve $r = \theta^2$ at $\theta = \pi$.
3. Find the point(s) where the tangent line to the polar curve $r = 2 + \sin \theta$ is horizontal.
4. Find the area enclosed by one leaf of the curve $r = \sin 2\theta$.
5. Find the area of the region bounded by $r = \cos \theta$ for $\theta = 0$ to $\theta = \pi/4$.