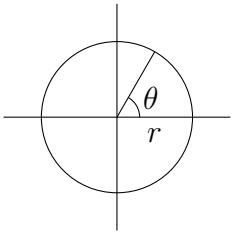
Calculus of Polar Curves (Appendix H2)

Thanks to Faan Tone Liu

Key Points:

- Area of a sector:

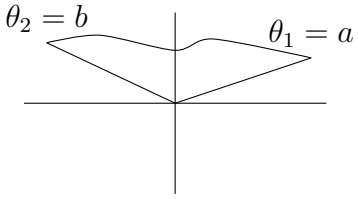


Area of entire circle =

Fraction of circle =

Area of sector =

- Area of a polar region:



Area of thin slice =

Estimate of area =

Exact area =

- To find the slopes of tangent lines to polar curves and arc length of polar curves, use parametric equations:

$$x =$$

$$y =$$

$$\frac{dy}{dx} =$$

$$\text{Arc length} =$$

Arc length (simplified) =

- Other Notes:

Examples:

1. Find the area inside the region bounded by $r = 3 + 3\sin\theta$

2. Find the area of the region that lies inside both $r = 1 + \sin\theta$ and $r = 3\sin\theta$.

3. Find the length of $r = 2\csc\theta$ from $\theta = \frac{\pi}{6}$ to $\theta = \frac{\pi}{2}$. What is the slope of the curve at $x = \frac{\pi}{2}$?

4. Find the arc length of the cardioid $3 + 3\sin\theta$.