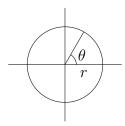
## Calculus of Polar Curves (Appendix H2)

Thanks to Faan Tone Liu

## **Key Points:**

• Area of a sector:

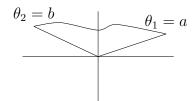


Area of entire circle =

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:

$$x =$$

$$y =$$

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

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  $x = \frac{\pi}{2}$ ?

Dec. 11, 2017

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