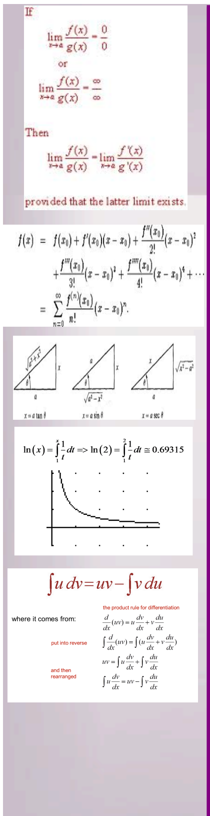
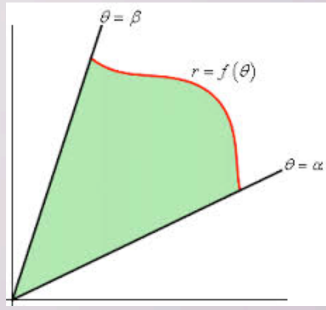
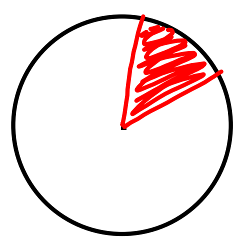


Calculus in Polar Coordinates



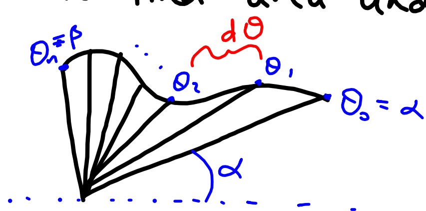
Calculus in Polar Coordinates

Begin with the area of a sector of a circle:

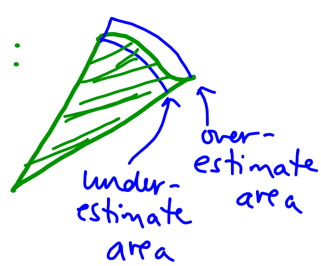


$A =$

To find area under a curve in the plane

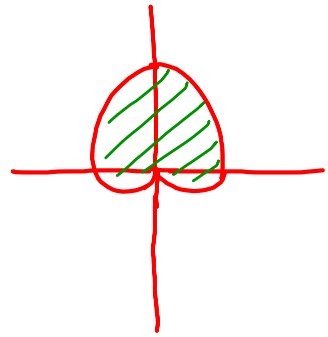


zoom in:



EX 1 Find the area inside $r = 3 + 3\sin\theta$

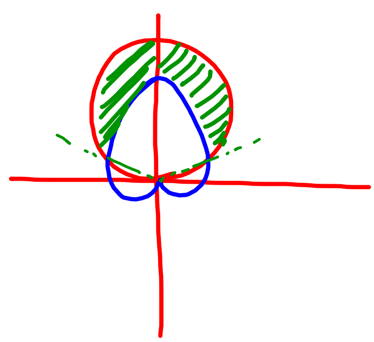
Cardioid



EX 2 Find the area inside $r = 3\sin\theta$ and outside $r = 1 + \sin\theta$.

circle

cardioid



Tangent line slope on a polar curve

$m = \frac{dy}{dx}$ in rectangular coordinates

polar coords $\Rightarrow \begin{cases} y = r\sin\theta = f(\theta)\sin\theta \\ x = r\cos\theta = f(\theta)\cos\theta \end{cases}$
$r = f(\theta)$

EX 3 Find the slope of the tangent line to $r = 2\text{-}3\sin\theta$ at $\theta = \pi/6$.

EX 4 For what values of θ will the tangent line to $r = 2\text{-}3\sin\theta$ be horizontal?