Math 1220 #29
Calculus in Polar Coordinates

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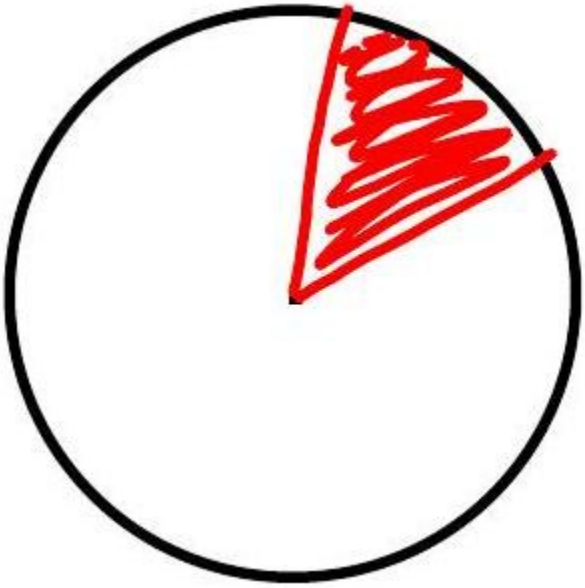
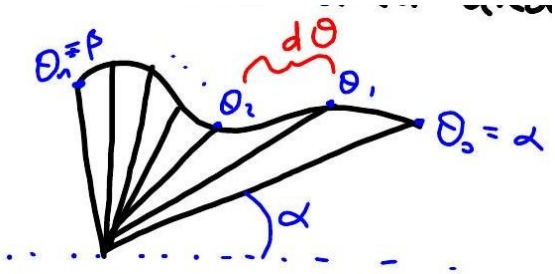
Begin with the area of a sector of a circle:

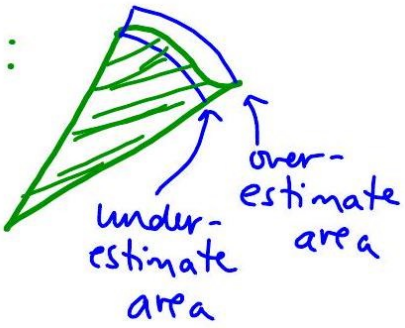
$A =$



To find area under a curve in the plane



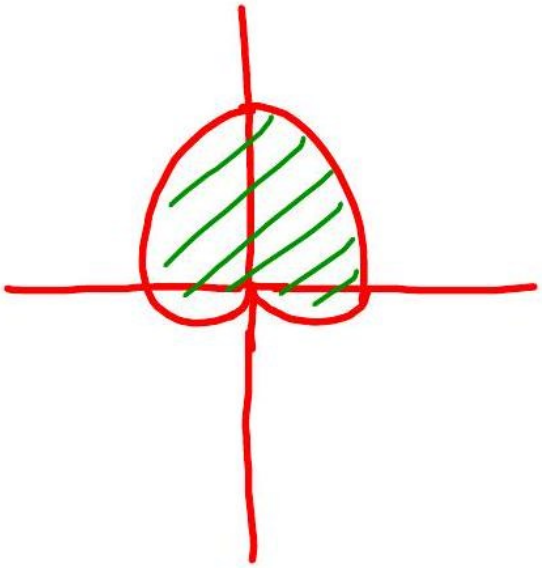
zoom in:



EX 1

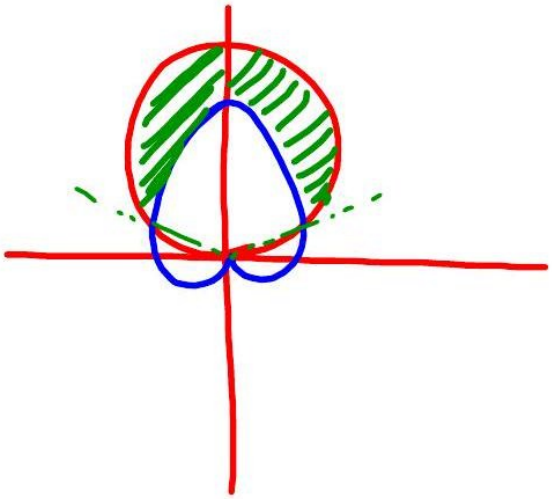
Find the area inside $r = 3 + 3\sin\theta$

Cardioid



EX 2

Find the area inside $r = 3\sin\theta$ (circle) and outside $r = 1 + \sin\theta$ (cardiod).



Tangent line slope on a polar curve

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

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

EX 3

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

EX 4

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