Charles [illegible]

Homework 11

$2 > \frac{\sqrt{2}}{2} > 1$

$1 > \frac{\sqrt{2}}{2} - 1 > 0$

1. $r^2 = \cos(2\theta)$

Find $r=0$

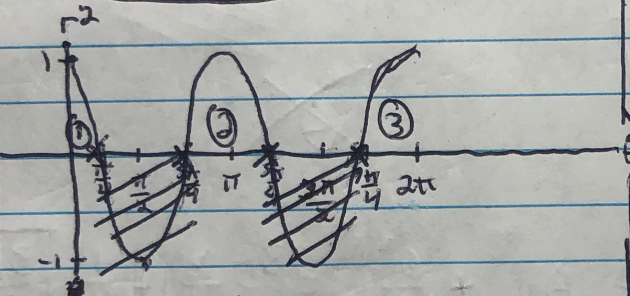
$0 = \cos(2\theta)$

$\theta = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

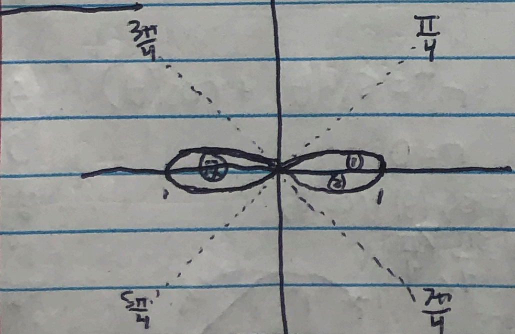
Ref Pts

θ	~~cos(2θ)~~ r^2
0	1
$\frac{\pi}{2}$	$\cancel{-1}$
π	1
$\frac{3\pi}{2}$	$\cancel{-1}$
2π	1

Flat Curve Graph



Polar



$r^2 = \sin(2\theta)$

Find $r=0$

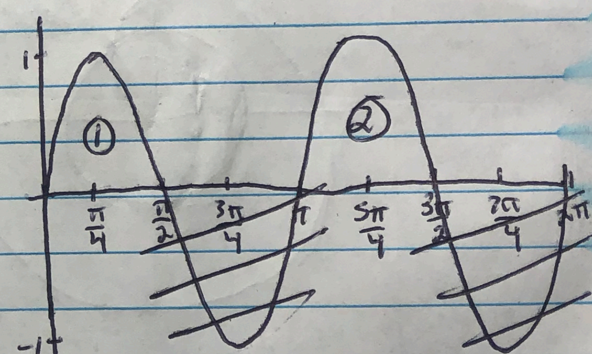
$0 = \sin(2\theta)$

$\theta = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi$

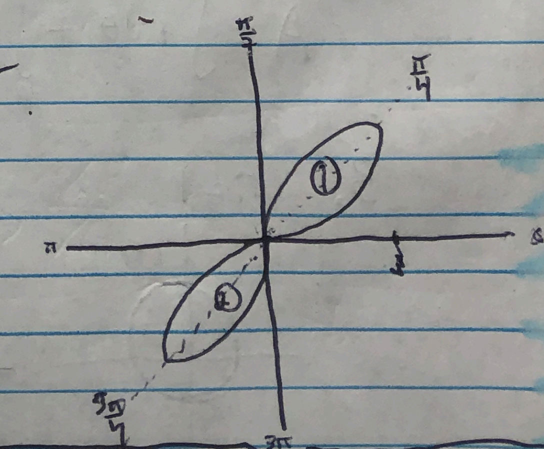
Ref pts

θ	r
$\frac{\pi}{4}$	1
$\frac{3\pi}{4}$	$\cancel{-1}$
$\frac{5\pi}{4}$	1
$\frac{7\pi}{4}$	$\cancel{-1}$

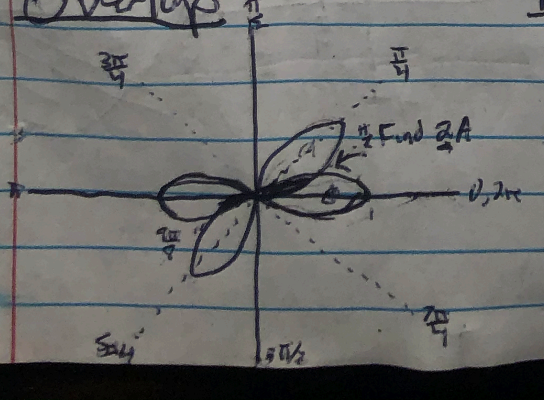
Flat Curve



Polar



Overlap



Intersec $\cos(2\theta) = \sin(2\theta)$

$\boxed{\theta = \frac{\pi}{8}, \frac{9\pi}{8}}$

$a - b = c$

$c + b = b$

$\frac{1}{2}\int_0^{\frac{\pi}{8}} (\sin 2\theta)\,d\theta \cdot 4 =$

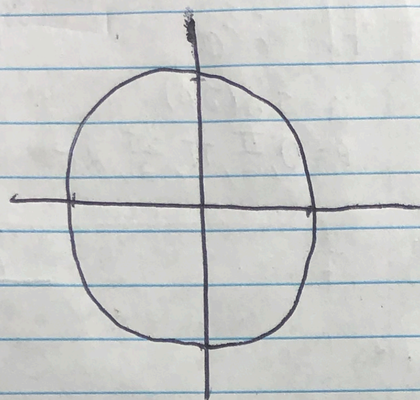
$2\left(\frac{\cos(2\theta)}{2}\right)\Big|_0^{\frac{\pi}{8}} = \cos\frac{\pi}{4} - \cos 0 = \boxed{\frac{\sqrt{2}}{2} - 1}$

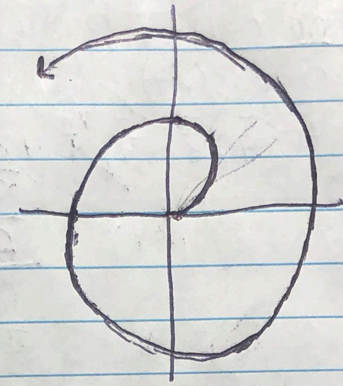
HW 11

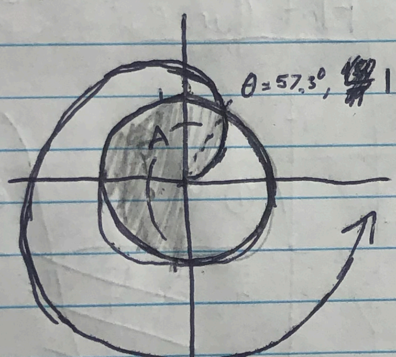
$1 = \theta^2$ $\quad \frac{\pi}{2}$ $\quad \frac{\pi^2}{4} = \left(\frac{\pi}{2}\right)^2$ (3.14) $\quad =1$

$\cancel{x} = \theta =$

2. $r = 1$ $\quad \cancel{r = \theta^2}$ | $r = \theta^2$







$\theta = 1$ $\quad \frac{x\pi}{180} = 1$

$\boxed{\theta = 57.3°}$ $\quad \frac{x\pi}{\pi} = \frac{180}{\pi}$

$\theta^2 = 1$ $\quad 1 \cdot \frac{\pi}{180} = \frac{\pi}{180}$ $\quad x = \frac{180}{\pi}$

$\cancel{\frac{180\pi}{180} = \pi}$

$\cancel{\theta^2}$

$$A = \int_1^{\frac{3\pi}{2}} 1\, d\theta + \int_0^1 \theta^2\, d\theta = \theta \Big|_1^{\frac{3\pi}{2}} + \frac{\theta^3}{3}\Big|_0^1 = \left(\frac{3\pi}{2} - \frac{3}{3}\right) + \frac{1}{3} = \boxed{\frac{3\pi}{2} - \frac{2}{3}}$$

3. $r_1 = 1$ $\quad r_2^2 = \sin(\theta) + \cos(\theta)$

$r = 0$

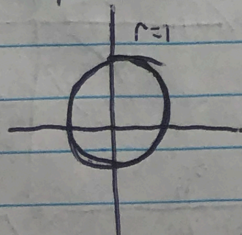
$0 = \sin(\theta) + \cos(\theta)$

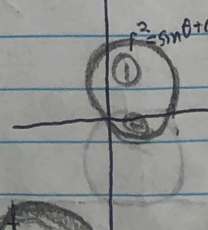
$\theta = \frac{3\pi}{4}, \frac{7\pi}{4}$

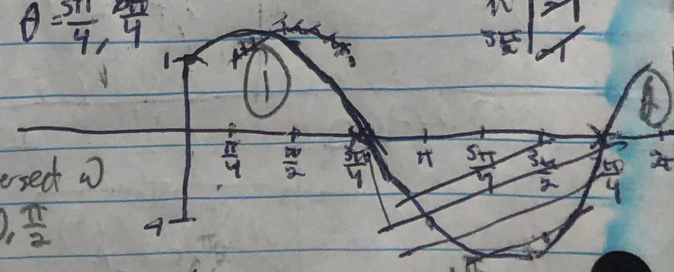
Pts

θ	r
0	1
$\frac{\pi}{2}$	1
π	$\cancel{-1}$
$\frac{3\pi}{2}$	$\cancel{-1}$

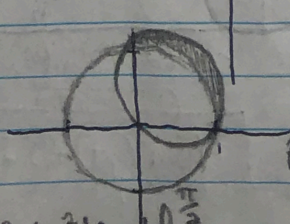
$\frac{2\pi}{1}$







Overlap



Intersect @ $\theta = 0, \frac{\pi}{2}$

$$A = \frac{1}{2}\int_0^{\frac{\pi}{2}} (r_2)^2 - (r_1)^2\, d\theta = \frac{1}{2}\int_0^{\frac{\pi}{2}} \left((\sin\theta + \cos\theta)^2 - 1\right) d\theta = \frac{1}{2}\left(\sin\theta - \cos\theta - \theta\right)\Big|_0^{\frac{\pi}{2}}$$

$$A = \frac{1}{2}\left(\left(1 - \cancel{0} - \frac{\pi}{2}\right) - \left(\cancel{0} - 1 - \cancel{0}\right)\right) = \frac{1}{2}\left(2 - \frac{\pi}{2}\right) = \frac{4}{4} - \frac{\pi}{4} = \boxed{\frac{4 - \pi}{4} \text{ units}} = \boxed{0.21}$$