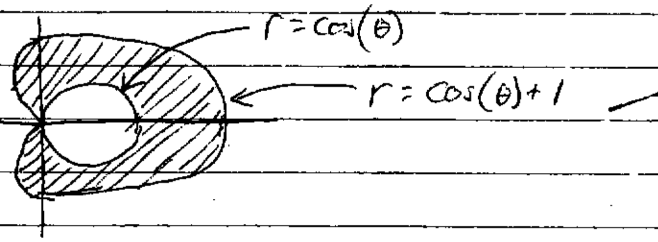
Turn in Problem

#16 sec 9.3 pg 590

$r = \cos(\theta) + 1$ and $r = \cos(\theta)$

First, I will graph these equations



$A = \frac{1}{2}\int_\alpha^\beta r^2\, d\theta$ From page 587 of our textbook

The problem w/ the book is that with $r = \cos(\theta)$, it wraps around ~~twice~~ over the range $0 \le \theta \le 2\pi$ which doubles the area expected. This is shown in the following ~~chart~~ table.

θ	$\cos\theta$
$0 \to \pi/2$	$1 \searrow 0$
$\pi/2 \to \pi$	$0 \searrow -1$
$\pi \to 3\pi/2$	$-1 \nearrow 0$
$3\pi/2 \to 2\pi$	$0 \nearrow 1$

Here it shows all you need to go around once, is to go to π

Therefore, the correct area equation is

$$A = \frac{1}{2}\int_0^{2\pi} (\cos(\theta)+1)^2\, d\theta - \frac{1}{2}\int_0^{\pi} \cos^2\theta\, d\theta$$

Good

$$= \frac{1}{2}\int_0^{2\pi} (\cos^2\theta + 2\cos\theta + 1)\, d\theta - \frac{1}{2}\int_0^{\pi} \cos^2\theta\, d\theta$$

$$\frac{1}{2}(3\pi) - \frac{1}{2}\left(\frac{1}{2}\pi\right) = 3.92699 = \boxed{\frac{5}{4}\pi}$$ ✓