SKETCH $r = 2 - 3\sin\theta$

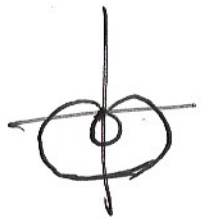
$a = 2 \quad b = -3$

$0 < \left|\frac{a}{b}\right| = \left|\frac{2}{-3}\right| = \frac{2}{3} < 1 \longrightarrow$ LIMACONS WITH LOOP (PASS THROUGH POLE)

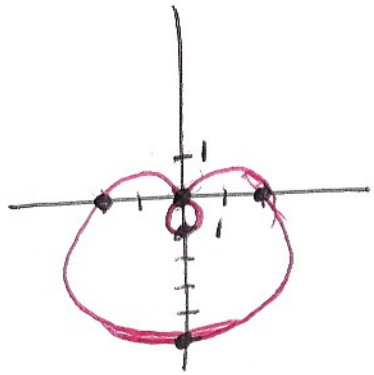
sin $\longrightarrow$ SYM OVER y-AXIS

$b < 0 \longrightarrow$ "FAT" END IN $-$ ← NEGATIVE DIRECTION

"BIGGER"



	θ	r
POS X-AXIS ←	0	$2 - 3\sin 0 = 2 - 3(0) = 2$
NEG POS y-AXIS ←	$\frac{\pi}{2}$	$2 - 3\sin\frac{\pi}{2} = 2 - 3(1) = -1 < 0$
NEG X-AXIS ←	π	$2 - 3\sin\pi = 2 - 3(0) = 2$
NEG y-AXIS ←	$\frac{3\pi}{2}$	$2 - 3\sin\frac{3\pi}{2} = 2 - 3(-1) = 5$



$r = a\cos n\theta$ OR $r = a\sin n\theta$ $\quad n \in \mathbb{Z}^+$

ROSE CURVE

WITH n PETALS IF n IS ODD

$2n$ EVEN

(IMPOSSIBLE TO GET ROSE CURVE WITH AN EVEN # OF PETALS NOT DIVISIBLE BY 4)

$r = a\cos n\theta$ HAS A PETAL SYM OVER POS X-AXIS

$r = a\sin n\theta$ IS $r = a\cos n\theta$ ROTATED AROUND POLE BY $\frac{\pi}{2n}$ RADIANS

INTERSECTIONS OF POLAR GRAPHS

FIND INTERSECTIONS (IN (x,y)) OF AS WELL AS (r,θ)

① $r = \sin\theta$ —
$r = \cos\theta$ —
$\theta \in [0, 2\pi]$

$\sin\theta = \cos\theta$ (SAME (r,θ) ON BOTH C

$\tan\theta = 1$

$\theta_{REF} = \frac{\pi}{4} \rightarrow \theta = \frac{\pi}{4}, \frac{\pi}{4} + \pi = \frac{5\pi}{4}$

INTERSECT @ POLE

↓

IS $r=0$ POSSIBLE ON BOTH CURVES (MAYBE @ DIFFERENT θ)?

$r = \sin\theta = 0 \rightarrow \theta = 0$

$r = \cos\theta = 0 \rightarrow \theta = \frac{\pi}{2}$

$r = \sin\frac{5\pi}{4} = -\frac{\sqrt{2}}{2}$ $r = \cos\frac{5\pi}{4} = -\frac{\sqrt{2}}{2}$

$(x,y) = \left(-\frac{\sqrt{2}}{2}\cos\frac{5\pi}{4}, -\frac{\sqrt{2}}{2}\sin\frac{5\pi}{4}\right)$

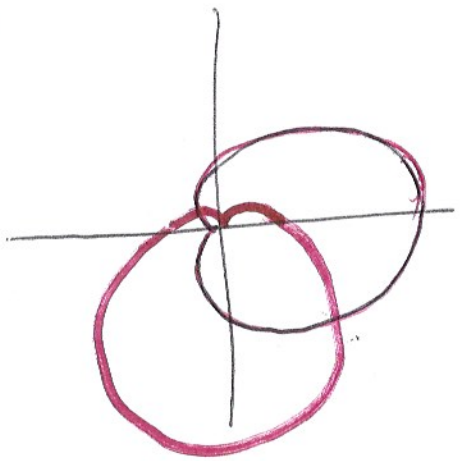
$= \left(-\frac{\sqrt{2}}{2}\cdot\frac{-\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\cdot\frac{-\sqrt{2}}{2}\right)$

$= \left(\frac{1}{2}, \frac{1}{2}\right)$

$r = 1 + \cos\theta$ ——

$r = -1 - \sin\theta$ ——

$\theta \in [0, 2\pi]$



$r = 0$?

$1 + \cos\theta = 0$ $\quad -1 - \sin\theta =$

$\cos\theta = -1$ $\quad \sin\theta =$

$\theta = \pi$ $\quad \theta =$

INTERSECTION @ P

$1 + \cos\theta = -1 - \sin\theta$

$(\cos\theta + \sin\theta)^2 = (-2)^2$

$\cos^2\theta + 2\sin\theta\cos\theta + \sin^2\theta = 4$

$1 + \sin 2\theta = 4$

$\sin 2\theta = 3$ IMPOSSIBLE (NO SOL'N)

(r, θ) IS THE SAME POIN

$(r, \theta + 2n\pi)$ AND $(-r, \theta + \pi$

↓

(r, θ) IS THE SAME POINT A

$(-r, \pi + \theta)$

NEED TO SUB $(-r, \pi + \theta)$

INTO EQ'NS 1 AT A TIME