

10.8

SKETCH $r = -3 + 5\cos\theta$

$$a = -3$$

$$b = 5$$

$$\left| \frac{a}{b} \right| = \left| \frac{-3}{5} \right| = \frac{3}{5}$$

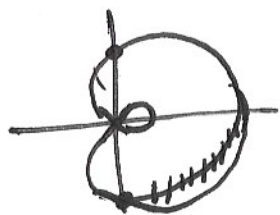
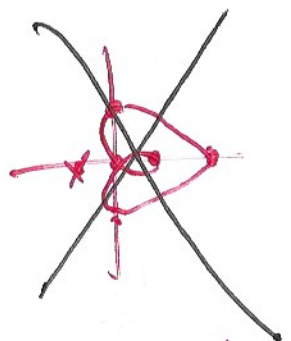
LIMACON WITH LOOP



(INCLUDES POLE)

 $\uparrow \uparrow \uparrow$
 $a, b \in \mathbb{R}$ MUST BE θ NOT 2θ NOT $\frac{1}{2}\theta$

...

 $\cos \rightarrow$ X-AXIS = AXIS OF SYMMETRY $b > 0 \rightarrow$ "BIG" END POINTS TOWARDS
POSITIVE X-AXIS

$$\theta$$

$$r = -3 + 5\cos\theta$$

$$0$$

$$-3 + 5\cos 0 = -3 + 5 \cdot 1 = 2$$

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

$$-3 + 5\cos \frac{\pi}{2} = -3 + 5 \cdot 0 = -3$$

$$\pi$$

$$-3 + 5\cos \pi = -3 + 5 \cdot (-1) = -8$$

$$\frac{3\pi}{2}$$

$$-3 + 5\cos \frac{3\pi}{2} = -3 + 5 \cdot 0 = -3$$

SAME

$$(r, \theta)$$

$$(x, y)$$

$$(2, 0)$$

POSITIVE X-INT = 2

$$(-3, \frac{\pi}{2})$$

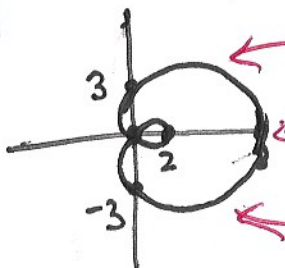
NEGATIVE Y-INT = -3

$$(-8, \pi)$$

POSITIVE X-INT = 8

$$(-3, \frac{3\pi}{2})$$

POSITIVE Y-INT = 3



PUFF OUTWARD

FLATTER END

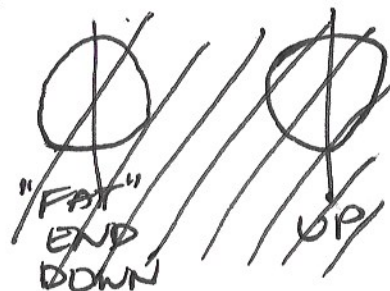
PUFF OUTWARD

SKETCH $r = 5 - 2\sin\theta$ USING POLAR GRAPHING 2
 $a = 5, b = -2$ HANDOUT

① $\left|\frac{a}{b}\right| = \left|\frac{5}{-2}\right| = \frac{5}{2} \rightarrow$ CONVEX LIMAÇON 
 $\frac{5}{2} > 2$ (DOESN'T GO THROUGH POLE)

② AXIS OF SYM $\rightarrow$ y-AXIS
 (sin)

③ "~~FAT~~" END POINTS DOWN
 "BIGGER" (- IN FRONT OF $\sin\theta$)



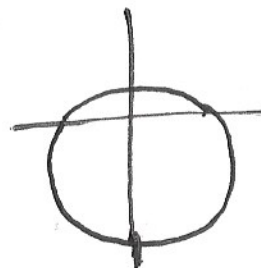
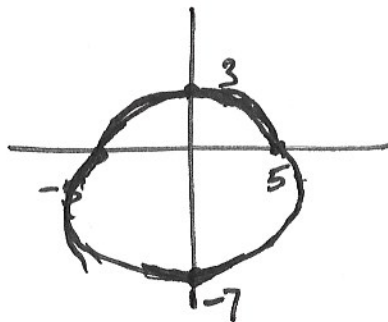
θ	r
0	5
$\frac{\pi}{2}$	3
π	5
$\frac{3\pi}{2}$	7

POSITIVE X-INT = 5

POSITIVE y-INT = 3

NEGATIVE X-INT = -5

NEGATIVE y-INT = -7



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

ROSE CURVES (IF $n > 1$)
CIRCLE (IF $n = 1$)

$$\frac{n}{\# \text{ PETALS}} = \begin{cases} n, & \text{IF } n \text{ IS ODD} \\ 2n, & \text{IF } n \text{ IS EVEN} \end{cases}$$

n	$\# \text{ PETALS}$
1	1
2	4
3	3
4	8
5	5
6	12
7	7
8	16

eg. ROSE CURVE WITH 24 PETALS
 $r = \sin 12\theta$

ROSE CURVE WITH 23 PETALS
 $r = \sin 23\theta$

NO ROSE CURVE WITH 22 PETALS
 $r = \sin 11\theta \rightarrow 11 \text{ PETALS}$
 ~~$r = \sin 22\theta \rightarrow 44 \text{ PETALS}$~~