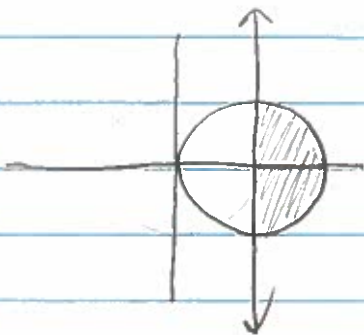


6) Sketch the region where $0 < 3 \sec \theta \leq r \leq 6 \cos \theta$.

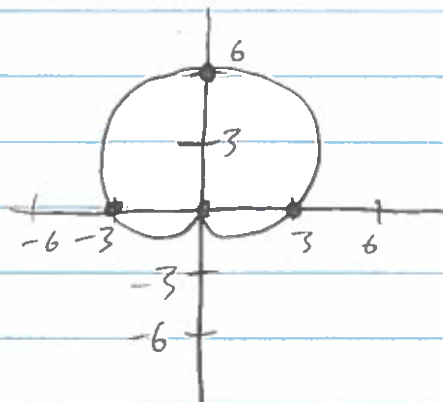
$$\begin{aligned}r &= 3 \sec \theta \\r \cos \theta &= 3 \\x &= 3\end{aligned}$$

$$\begin{aligned}r &= 6 \cos \theta \\r^2 &= 6r \cos \theta \\x^2 + y^2 &= 6x \\x^2 - 6x + 9 + y^2 &= 9 \\(x-3)^2 + y^2 &= 9\end{aligned}$$



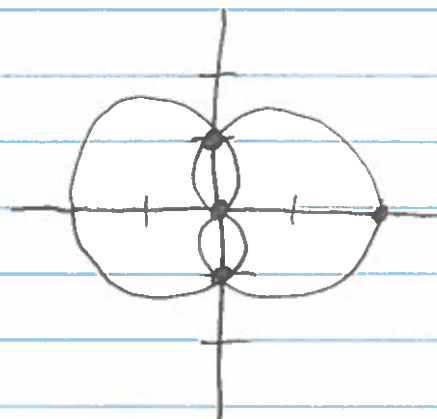
⑦ Sketch the cardioid $r = 3 + 3 \sin \theta$.

θ	r
0	$3+0=3$
$\pi/2$	$3+3=6$
π	$3+0=3$
$3\pi/2$	$3-3=0$
2π	$3+0=3$



⑧ Sketch the cardioids $r = 1 + \cos \theta$, $r = 1 - \cos \theta$.
At what points do they intersect?

θ	$r = 1 + \cos \theta$	$r = 1 - \cos \theta$
0	$1+1=2$	$1-1=0$
$\pi/2$	$1+0=1$	$1-0=1$
π	$1-1=0$	$1+1=2$
$3\pi/2$	$1+0=1$	$1-0=1$
2π	$1+1=2$	$1-1=0$

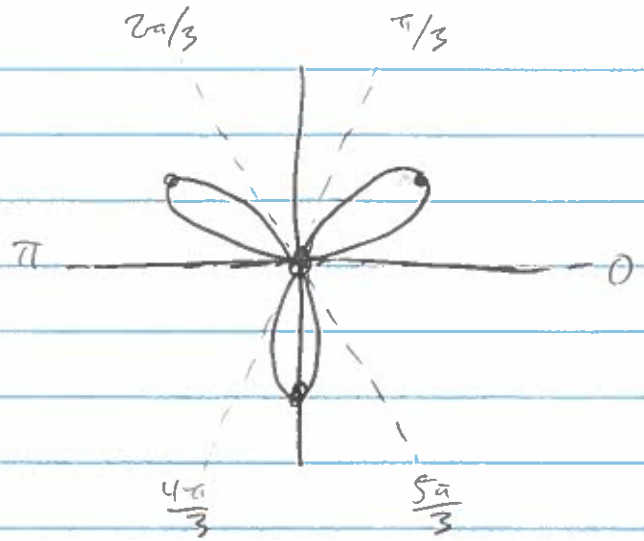


Intersect at $p(1, \frac{\pi}{2}) = (0, 1)$
and $p(1, \frac{3\pi}{2}) = (0, -1)$

9) Sketch the "three leaved rose" $r = \sin 3\theta$.

θ	r
0	$\sin(0) = 0$
$\pi/6$	$\sin(\frac{\pi}{2}) = 1$
$\pi/3$	$\sin(\pi) = 0$
$\pi/2$	$\sin(\frac{3\pi}{2}) = -1$
$2\pi/3$	$\sin(2\pi) = 0$
$5\pi/6$	$\sin(\frac{5\pi}{2}) = 1$
π	$\sin(3\pi) = 0$
$7\pi/6$	-1
$4\pi/3$	0
$3\pi/2$	1
$5\pi/3$	0
$11\pi/6$	-1
2π	0

Traces over
original
from $0 \leq \theta \leq \pi$



(10) Convert $(-\sqrt{3}, 1)$ to polar.

$$x^2 + y^2 = r^2$$

$$3 + 1 = r^2$$

$$4 = r^2$$

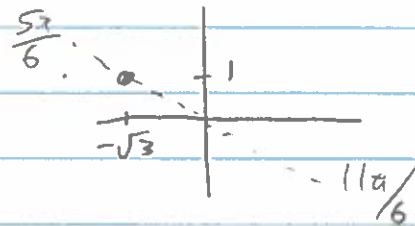
$$r = 2$$

$$\tan \theta = y/x$$

$$\tan \theta = -1/\sqrt{3}$$

$$\theta = 5\pi/6 \text{ OR } 11\pi/6$$

$$P(2, 5\pi/6)$$



(11) Convert the circle $x^2 + (y-4)^2 = 16$ into polar.

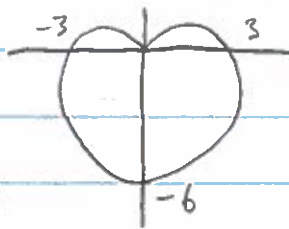
$$x^2 + y^2 - 8y + 16 = 16$$

$$r^2 - 8r \sin \theta = 0$$

$$r - 8 \sin \theta = 0$$

$$r = 8 \sin \theta$$

(12) Give a polar EQ for the curve pictured here:



Cardioid

$$r = a \pm a \sin \theta$$

$$r = a \pm a \cos \theta$$

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

θ	r	θ	r
0	$3 - 0 = 3$	π	$3 - 0 = 3$
$\pi/2$	$3 - 3 = 0$	$3\pi/2$	$3 + 3 = 6$