11.4 Polar Graphs Day 2

Essential Question:

How do I graph a polar equation without a calculator?

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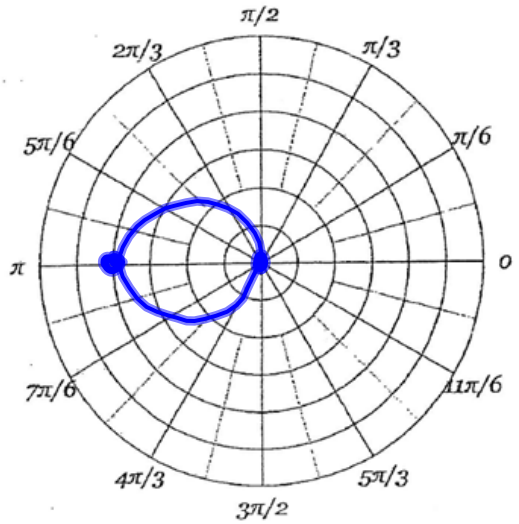
Tell what type of graph it is, make a table, and sketch a graph.

1. $r = -4\cos\theta$

circle on x-axis reflected



r	θ
-4	0
0	π/2
4	π
0	3π/2

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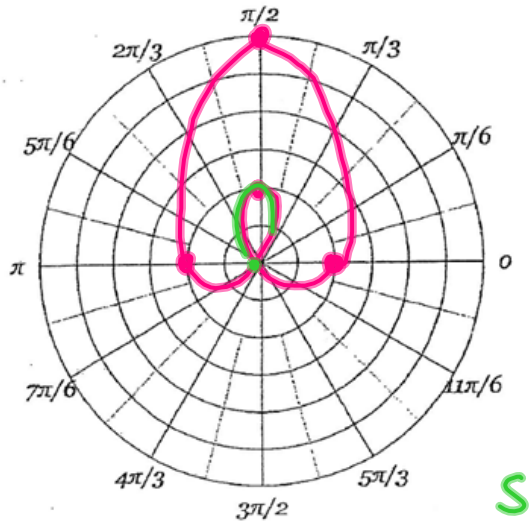
Tell what type of graph it is, make a table, and sketch a graph.

2. $r = 2 + 4\sin\theta$

$a < b$

limaçon w/ loop on y-axis



r	θ
2	0
6	π/2
2	π
−2	3π/2

Where does the loop begin?

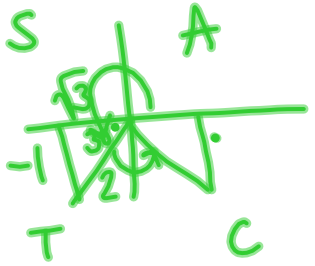
$0 = 2 + 4\sin\theta$

$-\frac{1}{2} = \sin\theta$

$r = 0$

$\sin^{-1}\left(-\frac{1}{2}\right) = \theta$

$\frac{7\pi}{6}$



Where does the loop end?

$\frac{11\pi}{6}$

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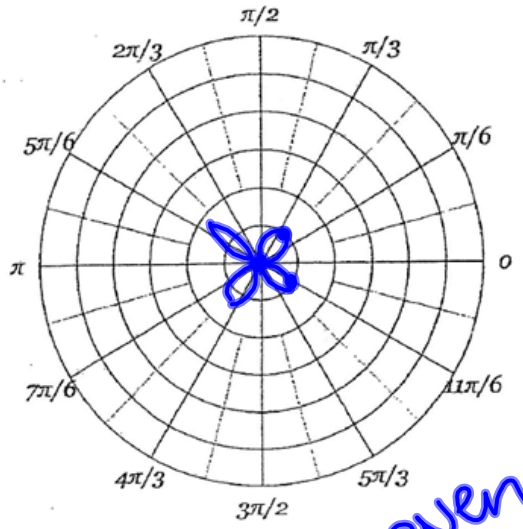
Tell what type of graph it is, make a table, and sketch a graph.

3. $r = \sin(2\theta)$

rose w/ 4 petals



r	2θ	θ
0	0	0
1	π/2	π/4
0	π	π/2
−1	3π/2	3π/4

Where do the petals begin & end?

$0 = \sin 2\theta$

$\sin^{-1}(0) = 2\theta$

$\frac{0}{2}$ or $\frac{\pi}{2} = \frac{2\theta}{2}$

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

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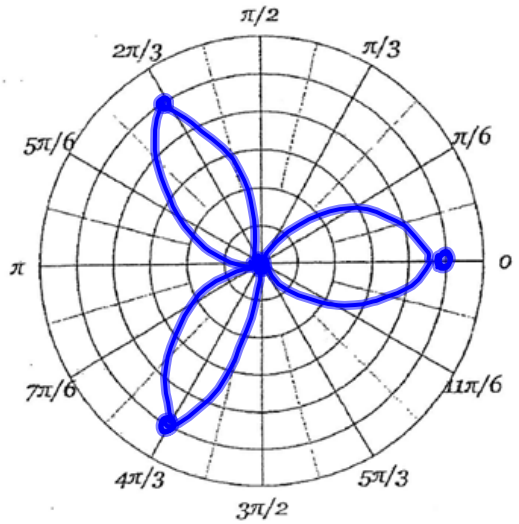
Essential Question: How do I graph a polar equation without a calculator?

Tell what type of graph it is, make a table, and sketch a graph.

4. $r = 5\cos 3\theta$

rose w/ 3 petals



r	θ
5	0
0	π/6
-5	π/3
0	π/2

Where do the petals begin & end?

$\frac{0}{5} = \frac{5\cos 3\theta}{5}$

$\cos^{-1}(0) = 3\theta$

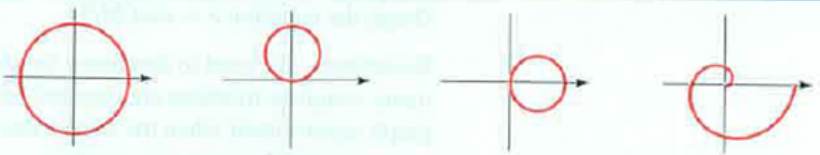
$\frac{\pi}{2} + \pi n = 3\theta$

$\frac{\pi}{6} + \frac{\pi}{3}n$

11.4 Polar Graphs Day 2

Some Common Polar Curves

Circles and Spiral



$r = a$ circle | $r = a \sin\theta$ circle | $r = a \cos\theta$ circle | $r = a\theta$ spiral

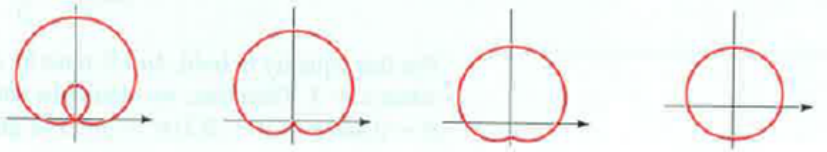
Limaçons

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

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

$(a > 0, b > 0)$

Orientation depends on the trigonometric function (sine or cosine) and the sign of b.



$a < b$ limaçon with inner loop | $a = b$ cardioid | $a > b$ dimpled limaçon | $a \geq 2b$ convex limaçon

Roses

$r = a \sin n\theta$

$r = a \cos n\theta$

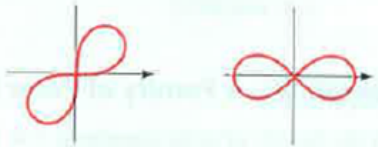
n-leaved if n is odd

$2n$-leaved if n is even

$r = a \cos 2\theta$ 4-leaved rose | $r = a \cos 3\theta$ 3-leaved rose | $r = a \cos 4\theta$ 8-leaved rose | $r = a \cos 5\theta$ 5-leaved rose

Lemniscates

Figure-eight-shaped curves



$r^2 = a^2 \sin 2\theta$ lemniscate | $r^2 = a^2 \cos 2\theta$ lemniscate