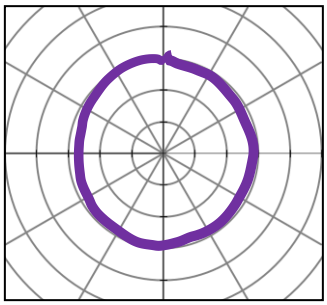
Precalculus Honors
6.5 Day 1 – Lines, circles, and Cardioids

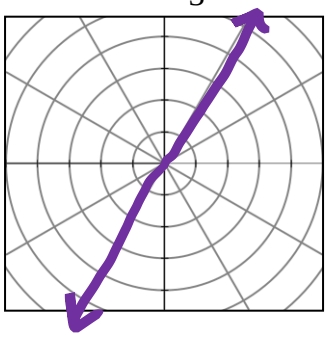
Name Key

Graph r = 3



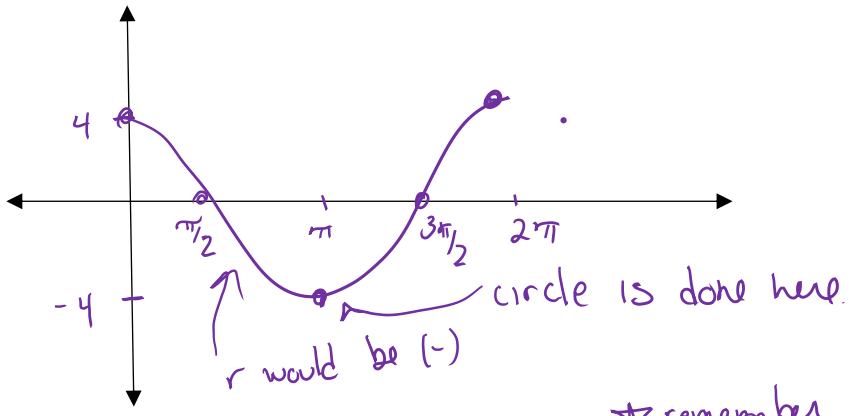
Descried the shape of the graph.

Graph $\theta = \frac{\pi}{3}$

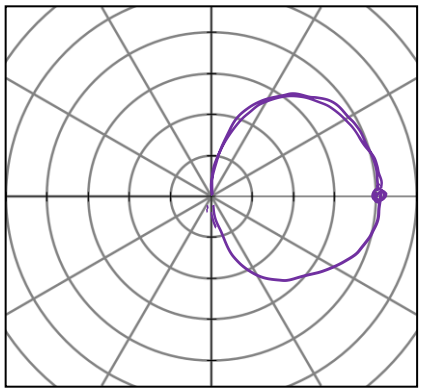


Descried the shape of the graph.

Graph the function $y = 4\cos\theta$ in a rectangular coordinate system.



Now graph $r = 4\cos\theta$.

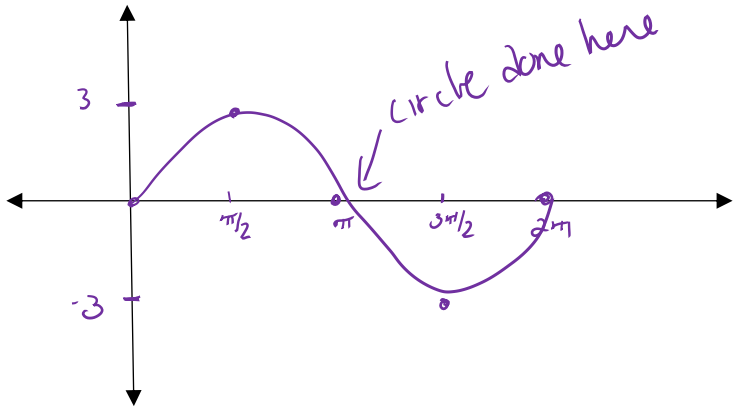


(r, θ)

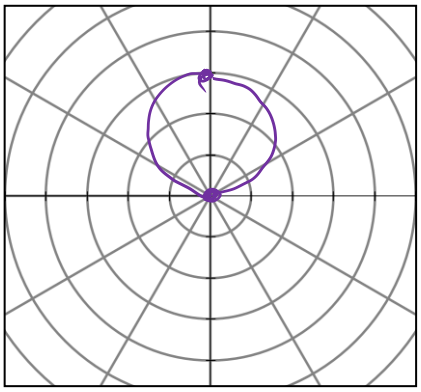
Let's confirm our graph of $r = 4\cos\theta$ by making a table.

r	θ
4	0
$2\sqrt{3}$	π/6
2	π/3
0	π/2
-4	π

Graph the function $y = 3\sin\theta$ in a rectangular coordinate system.



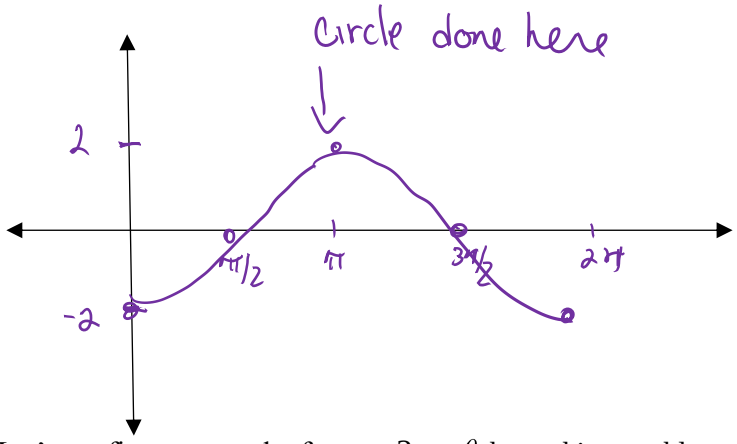
Now graph $r = 3\sin\theta$.



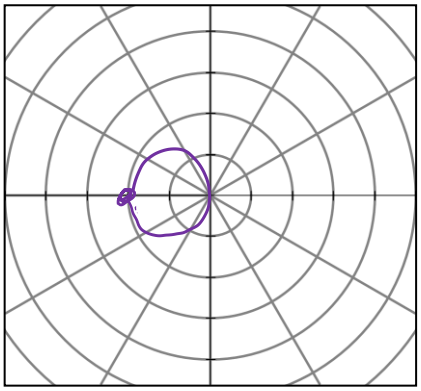
Let's confirm our graph of $r = 3\sin\theta$ by making a table.

r	θ
0	0
1.5	π/6
3	π/2
1.5	5π/6
0	π

Graph the function $y = -2\cos\theta$ in a rectangular coordinate system.



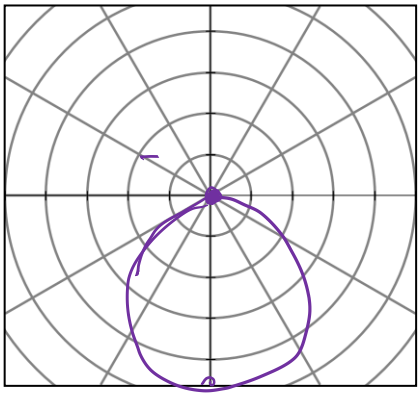
Now graph $r = -2\cos\theta$.



Let's confirm our graph of $r = -2\cos\theta$ by making a table.

r	θ
-1	π/3
0	π/2
1	2π/3
2	π

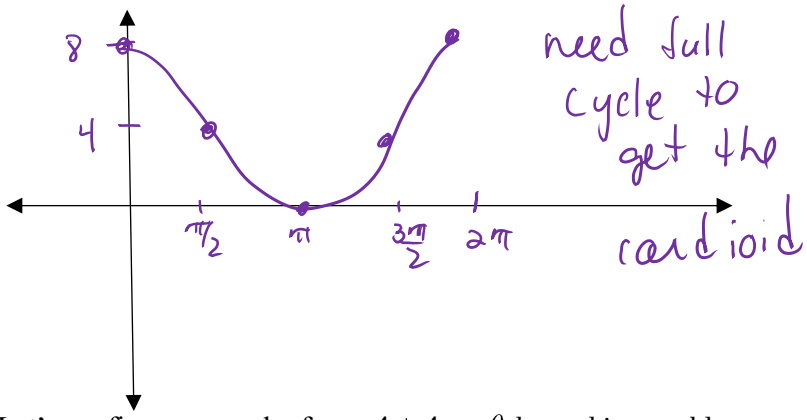
Graph $r = -5\sin\theta$



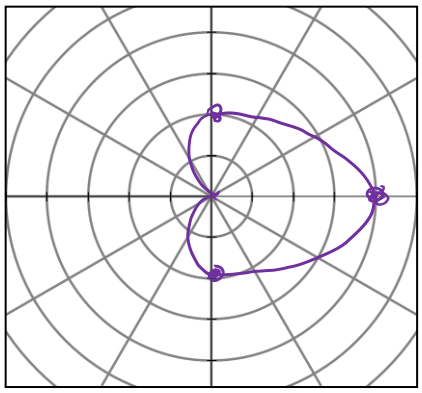
What observations can you make?

- The circle will lie on the X axis if it has a cosine in its equation.
- The circle will lie on the Y axis if it has a sine in its equation.
- Multiplying by a constant increases the size of the radius/diameter of the circle.
- Multiplying by a negative reflect the circle across an axis.

Graph the function $y = 4 + 4\cos\theta$ in a rectangular coordinate system.



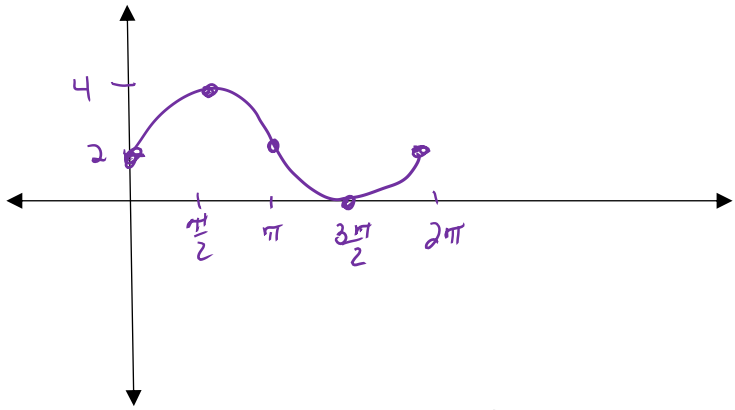
Now graph $r = 4 + 4\cos\theta$.



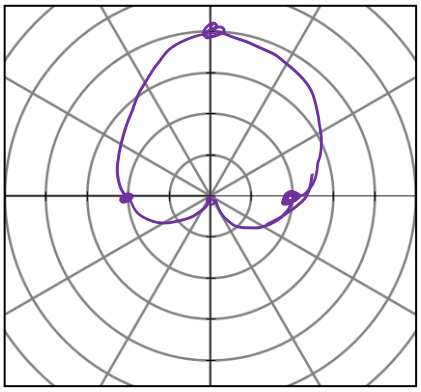
Let's confirm our graph of $r = 4 + 4\cos\theta$ by making a table.

r	θ
8	0
4	π/2
2	2π/3
0	π
2	2π/3
4	3π/2
8	2π

Graph the function $y = 2 + 2\sin\theta$ in a rectangular coordinate system.



Now graph $r = 2 + 2\sin\theta$.

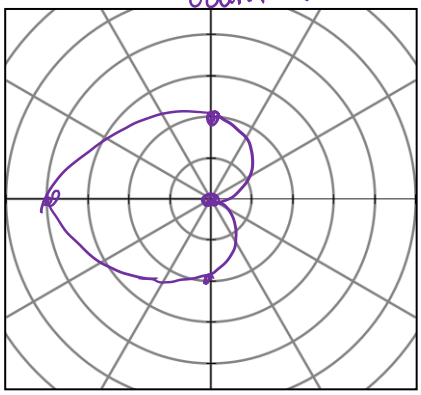


Let's confirm our graph of $r = 2 + 2\sin\theta$ by making a table.

r	θ
2	0
3	π/6
4	π/2
3	5π/6
2	π
0	3π/2
2	2π

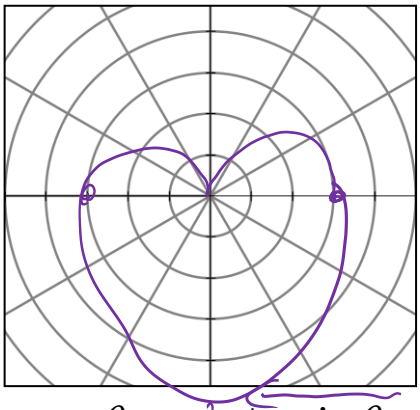
Graph the following:

$r = 4 - 4\cos\theta$ count by 2



count by 2

$r = 3 - 3\sin\theta$



This graph is called a Cardioid general form is $r = a \pm a\cos\theta$ or $a \pm a\sin\theta$

What observations did you make?

◊ The cardioid follows the same rules as the circle does in terms of which axis it lies on....

- Positive cosine ⇨ + x axis
- Negative cosine ⇨ − x axis
- Positive sine ⇨ + y axis
- Negative sine ⇨ − y axis

◊ The length of the cardioid can be found by 2a

◊ The intercepts of the cardioid can be found ±a