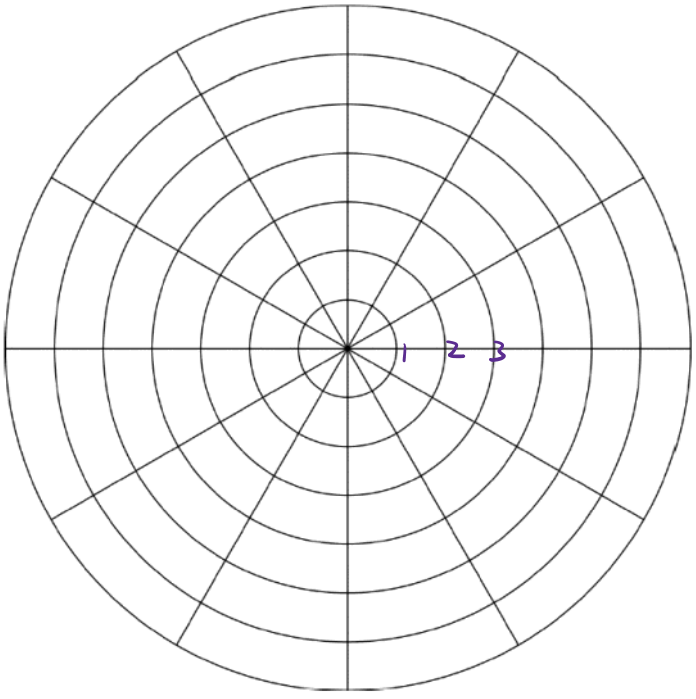
VI. Graph of Polar Equation ← won't be tested on

We use (r, θ) with $\begin{array}{c|c} \theta & r \end{array}$ ← "θ-r table"

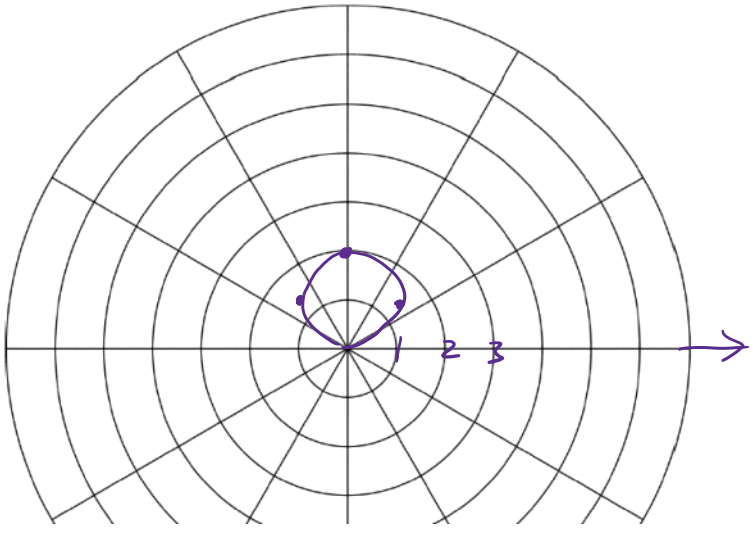
We have



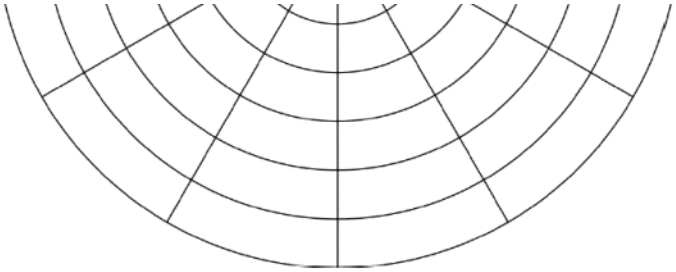
eg. Graph $r = 2\sin\theta$.

Sol:

θ	$r(r=2\sin\theta)$
0	0
$\frac{\pi}{4}$	1.41
$\frac{\pi}{2}$	2
$\frac{3\pi}{4}$	1.41
⋮	
π	0

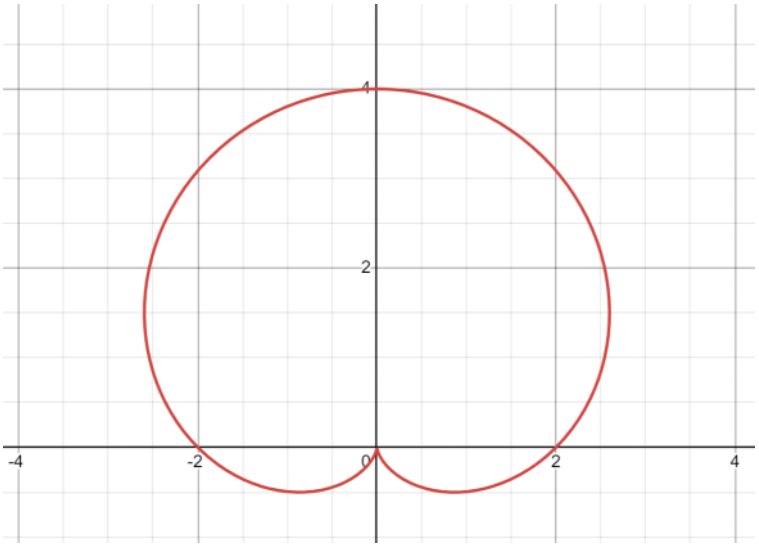


⋮	⋮
π	0
$\frac{5\pi}{4}$	-1.41
⋮	⋮
2π	0



eg. Graph $r = 2 + 2\sin\theta$

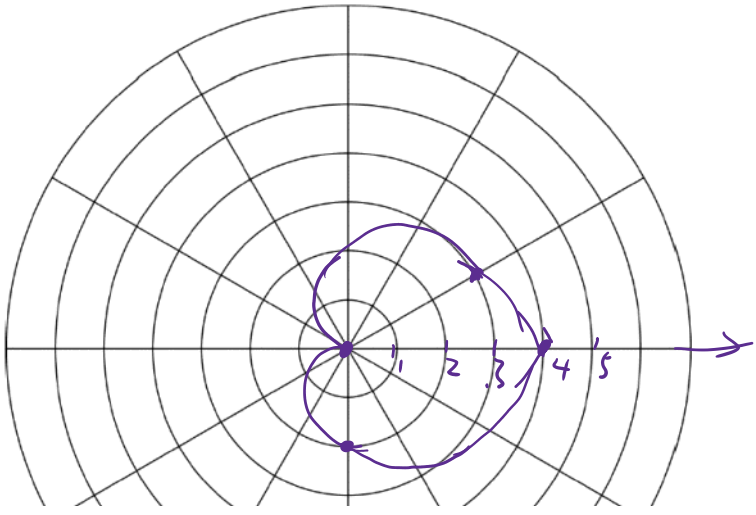
2 +



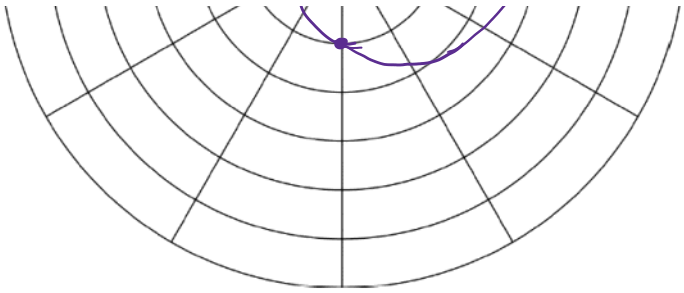
eg. Graph $r = 2 + 2\cos\theta$.

Sol:

θ	$r\ (r = 2 + 2\cos\theta)$
0	4
⋮	⋮
$\frac{\pi}{3}$	3
⋮	⋮
π	0
⋮	⋮
$\frac{3\pi}{2}$	2
⋮	⋮

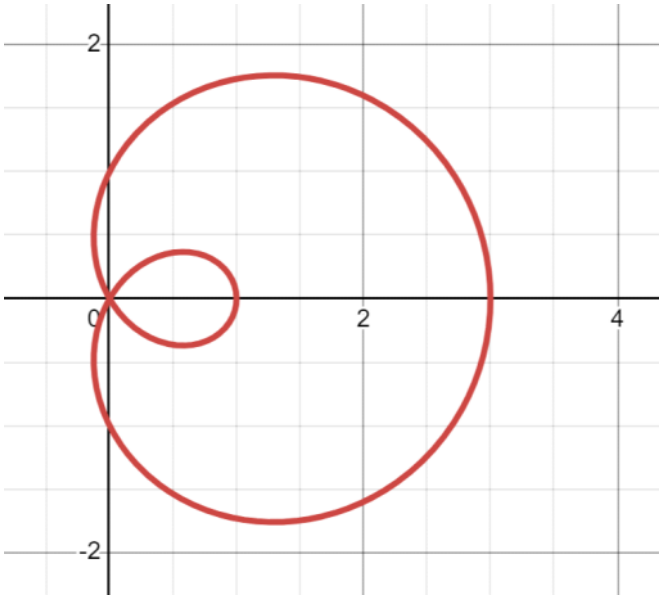


$\frac{3\pi}{2}$	2
⋮	⋮
2π	4

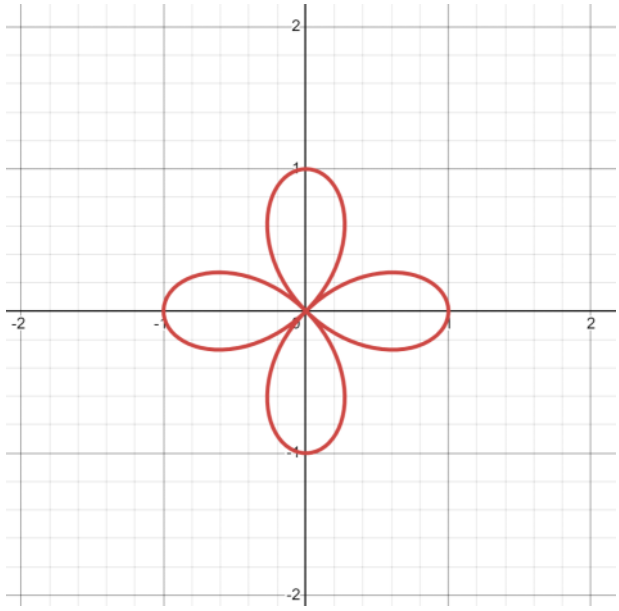


eg. Graph $r = 1 + 2\cos\theta$.

Sol:

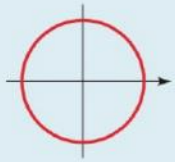


eg. Graph $r = \cos 2\theta$.



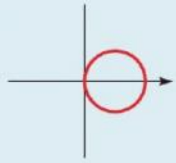
SOME COMMON POLAR CURVES

Circles and Spiral

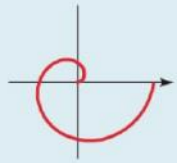


$r = a$
circle

$r = a \sin\theta$
circle



$r = a \cos\theta$
circle



$r = a\theta$
spiral

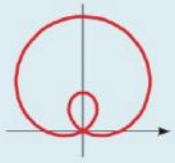
Limaçons

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

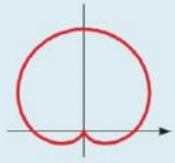
$r = a \pm b \cos\theta$

$(a > 0, b > 0)$

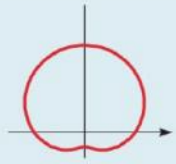
Orientation depends on the trigonometric function (sine or cosine) and the sign of b.



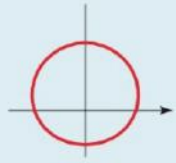
$a < b$
limaçon with inner loop



$a = b$
cardioid



$a > b$
dimpled limaçon



$a \geq 2b$
convex limaçon

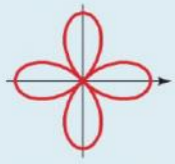
Roses

$r = a \sin n\theta$

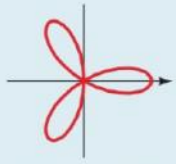
$r = a \cos n\theta$

n-leaved if n is odd

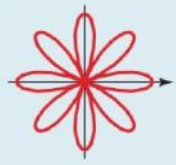
$2n$-leaved if n is even



$r = a \cos 2\theta$
4-leaved rose



$r = a \cos 3\theta$
3-leaved rose

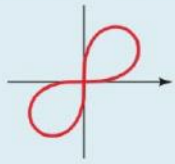


$r = a \cos 4\theta$
8-leaved rose

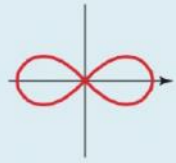
$r = a \cos 5\theta$
5-leaved rose

Lemniscates

Figure-eight-shaped curves



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



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