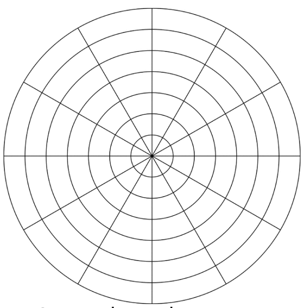
A Polar Phenomenon (Part 2)

Yesterday we looked at polar equations that represented small circles and roses. Today we're going to explore another type of polar graph: limaçons (pronounced lee-muh-sohns) which is the French word for snails! Can you guess what these will look like?

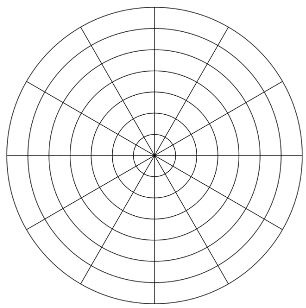
1. Go to https://bit.ly/2MCZDOi. Open the folder for "Part 3" and turn on the graph of $r = a + b\cos\theta$. Press play on the *b* slider (we won't be using the *n* slider today) and watch what happens.

2. Pause the *a* and *b* sliders to graph the following.

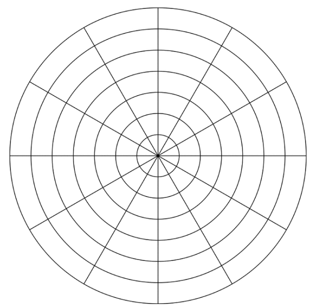
$r = 2 + 3\cos\theta$



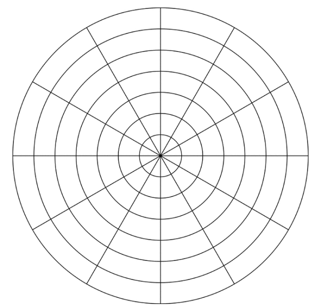
$r = 3 + 3\cos\theta$



$r = 4 + 3\cos\theta$



$r = 2 - 3\cos\theta$



3. What do you notice when…

$|a| < |b|$?

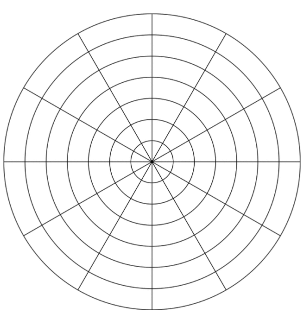
$|a| = |b|$?

$|a| > |b|$?

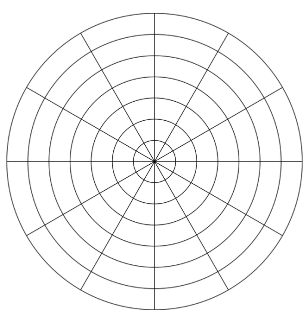
4. What kind of symmetry do these graphs have?

5. Turn off the graph of $r = a + b\cos\theta$ and turn on the graph of $r = a + b\sin\theta$. Graph the following:

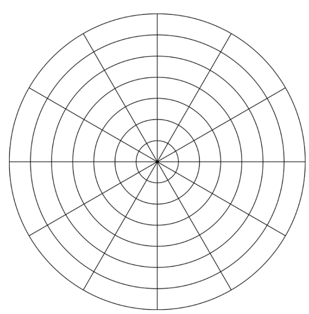
$r = 1 + 2\sin\theta$



$r = 2 - 2\sin\theta$



$r = 3 + 2\sin\theta$



6. Comment on some of the things you notice from the categories below. What is the same? What is different?

Shape
Symmetry
Max distance from the pole
Intercepts

Lesson 8.4 – Polar Graphs: Limacons

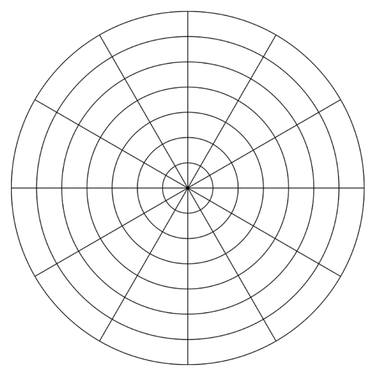
QuickNotes

Check Your Understanding

1. Consider the equation $r = 4 + 2\sin\theta$.
   a. Fill in the table of values.

θ	r
0	
$\pi/2$	
π	
$3\pi/2$	
2π	

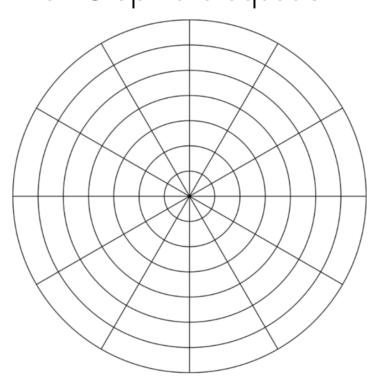
   b. Graph the equation.



2. Consider the graph of $r = -2 + 2\cos\theta$.
   a. Fill in the table of values.

θ	r
0	
$\pi/2$	
π	
$3\pi/2$	
2π	

   b. Graph the equation.



3. Write an equation of a looped limaçon with polar axis symmetry and a maximum radius of 11.

4. Explain why dented limaçons will never pass through the pole.