

Nspire Activity: Have a Heart...Or a Snail!



In this activity, you will observe how Cartesian graphs of cosine functions correspond to graphs of polar equations on a polar grid.

1. Make sketches for the graphs of the functions listed in #3, 4, and 5 in this activity. These functions are written in the form $y = a + b\cos x$. State the range of each function below each graph. Then, answer the following question.

How do the values of 'a' and 'b' in $y = a + b\cos x$ affect the graph of the trig function?

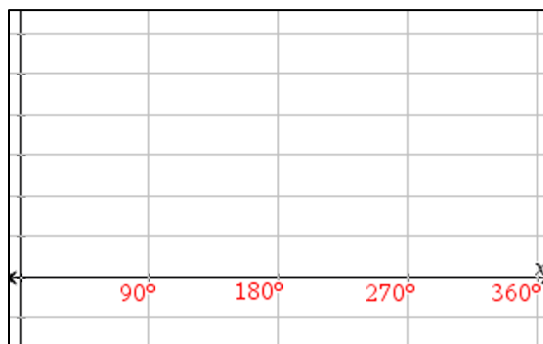
Part 1: Investigating the case of $a = b$

2. Open the file 'limaçon'. Move to page 2.2 of the document. You will see the graph of $y = 3 + 3\cos x$ on the left panel and a polar grid on the right panel.

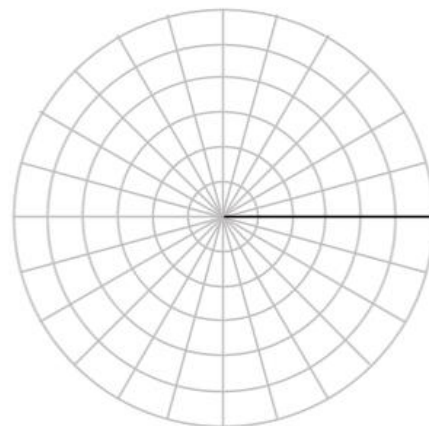
You will be observing the polar graph formed by tracing the graph of the function $y = 3 + 3\cos x$. As the graph is traced for 'x' values from $[0, 360^\circ]$, corresponding points in terms of 'r' and 'θ' for the graph of the polar equation $r = 3 + 3\cos \theta$ will be plotted on the polar grid.

3. Press play and observe the polar graph formed. Make a sketch of the polar graph and answer the questions that follow.

Function: $y = 3 + 3\cos x$



Polar Equation: $r = 3 + 3\cos \theta$



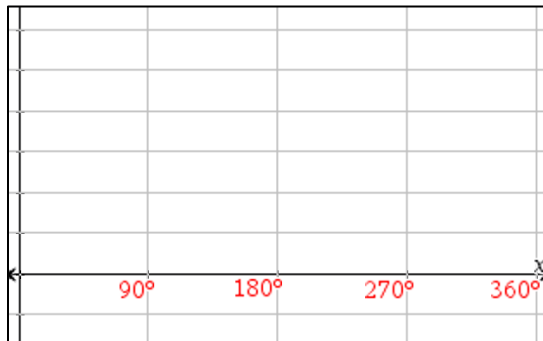
Range: _____

Describe the shape of the polar graph. Then, look at the range listed for the trig function above. Explain connections between the range of the trig function and the span of 'r' values shown in the polar graph that support its shape.

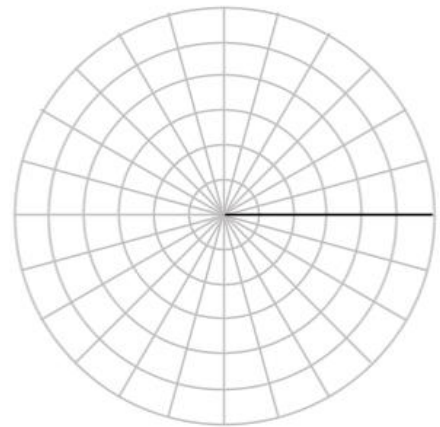
Part 2: Investigating the case of $a > b$

4. Move to page 3.2 of the document. Press play and observe the polar graph formed by tracing the function $y = 4 + 2\cos x$. Make a sketch of the polar graph and answer the questions that follow.

Function: $y = 4 + 2\cos x$



Polar Equation: $r = 4 + 2\cos \theta$



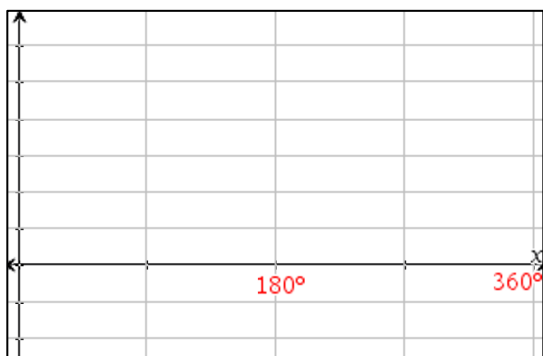
Range: _____

How is this polar graph different than when $r = 3 + 3\cos \theta$? Explain connections between the range of the trig function and the span of 'r' values shown in the polar graph that support its shape.

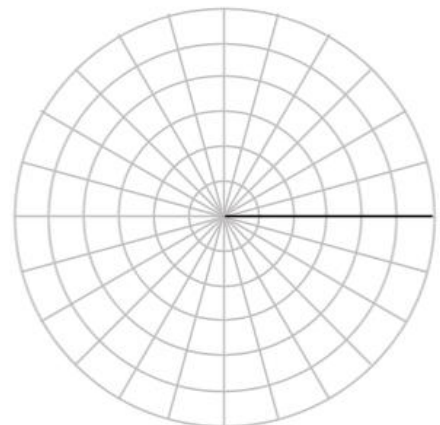
Part 3: Investigating the case of $a < b$

5. Move to page 4.2 of the document. Press play and observe the polar graph formed by tracing the function $y = 2 + 4\cos x$. Make a sketch of the polar graph and answer the questions that follow.

Function: $y = 2 + 4\cos x$



Polar Equation: $r = 2 + 4\cos \theta$



Range: _____

How is this polar graph different than when $r = 3 + 3\cos \theta$? Explain connections between the range of the trig function and the span of 'r' values shown in the polar graph that support its shape.