Section 6.5 Analyzing Polar Graphs

ROSE CURVES $r = a\cos(n\theta)$ $r = a\sin(n\theta)$ **where n is an integer greater than 1**

1. Graph: $r = 3\cos 2\theta$

How to graph a Polar Equation in the calculator.

Change Mode to POL (polar) *stay in radian mode

Type in equation for r1

Adjust window

$\theta min = 0, \theta max = 2\pi, \theta step = \pi/15$

X [-4,4]

Y[-4,4]

* x and y values will vary depending on the given equation

Change format (2^{nd} zoom) to PolarGC

Analyze the graph:

Domain: Range: Continuity: Boundedness:

Symmetry: Number of Pedals:

Graphs of Rose Curves

The graphs of $r = a\cos n\theta$ and $r = a\sin n\theta$, where $n > 1$ is an integer, have the following characteristics:

Domain: $(-\infty, \infty)$
Range: $[-|a|, |a|]$
Continuous
Symmetry: n even, symmetric about x-axis, y-axis, and the origin
n odd, $r = a\cos n\theta$ symmetric about x-axis
n odd, $r = a\sin n\theta$ symmetric about y-axis
Bounded
Maximum $|r|$ value: $|a|$
No asymptotes
Number of petals: n, if n is odd
$2n$, if n is even

Limaçon Curves

The **limaçon curves** are graphs of polar equations of the form

$$r = a \pm b \sin\theta \quad \text{and} \quad r = a \pm b \cos\theta,$$

where $a > 0$ and $b > 0$. *Limaçon*, pronounced "LEE-ma-sohn," is Old French for "snail." There are four different shapes of limaçons, as illustrated in Figure 6.52.

2. Graph $r = 3 - 3sin\theta$ in a graphing calculator, and analyze the graph.

3. Graph $r = 2 + 3cos\theta$ in a graphing calculator, and analyze the graph.

Graphs of Limaçon Curves

The graphs of $r = a \pm b \sin\theta$ and $r = a \pm b \cos\theta$, where $a > 0$ and $b > 0$, have the following characteristics:

Domain: $(-\infty, \infty)$
Range: $[a - b, a + b]$
Continuous
Symmetry: $r = a \pm b \sin\theta$, symmetric about y-axis
$r = a \pm b \cos\theta$, symmetric about x-axis
Bounded
Maximum $|r|$ value: $a + b$
No asymptotes

Section 6.5 HW

Analyze the graph of the polar curve

29. $r = 2 \sin 3\theta$

30. $r = -3 \cos 4\theta$

31. $r = 5 + 4 \sin \theta$

32. $r = 6 - 5 \cos \theta$

33. $r = 4 + 4 \cos \theta$

34. $r = 5 - 5 \sin \theta$

35. $r = 5 + 2 \cos \theta$

36. $r = 3 - \sin \theta$

37. $r = 2 + 5 \cos \theta$

38. $r = 3 - 4 \sin \theta$

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

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