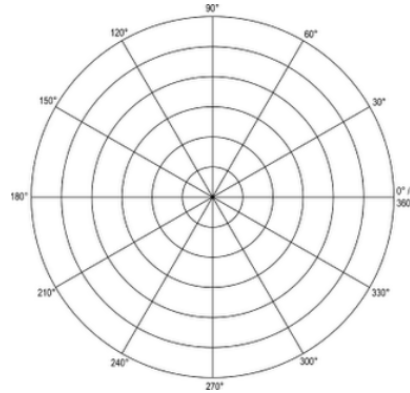


6.4 Notes: Graphs of Polar Functions

Ex. Graph $r = 4 \sin \theta$



Circles:

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

Graph the following equations on a graphing calculator. Graph at least 2 on polar graph paper.

- $r = 2 \cos \theta$
- $r = 5 \cos \theta$
- $r = -4 \cos \theta$
- $r = 3 \sin \theta$
- $r = -4 \sin \theta$

1. What affect does the value of a have on the graphs of the functions?
2. What affect does \sin and \cos have on the graph of the functions?

Limacon:

$$r = a \pm b \cos \theta \quad \text{and} \quad r = a \pm b \sin \theta$$
$$a > 0, b > 0$$

* The ratio $\frac{a}{b}$ determines a limacon's shape

Graph the following equations on a graphing calculator. Graph at least 2 on polar graph paper.

- $r = 2 - 4 \cos \theta$
- $r = 2 + 4 \cos \theta$
- $r = 3 + 3 \sin \theta$
- $r = 4 + 2 \sin \theta$
- $r = 3 + \sin \theta$

1. How does the ratio of $\frac{a}{b}$ affect the graph of the functions?

Rose Curves:

$$r = a \cos(n\theta) \text{ and } r = a \sin(n\theta), a \neq 0$$

Graph the following equations on a graphing calculator. Graph at least 2 on polar graph paper.

- $r = 3 \cos 2\theta$
- $r = 3 \sin 2\theta$
- $r = -3 \cos 2\theta$
- $r = 4 \sin 3\theta$
- $r = 4 \cos 3\theta$
- $r = 5 \sin 4\theta$

1. What affect does the value of a have on the graph of the function?
2. What affect does n have on the graph of the function?
3. What affect does \sin and \cos have on the graph of the function?

Lemniscates:

$$r^2 = a^2 \cos 2\theta \text{ and } r^2 = a^2 \sin 2\theta, a \neq 0$$

Graph the following on a graphing calculator. Graph at least 2 on polar graph paper.

- $r^2 = 4 \sin 2\theta$
- $r^2 = 4 \cos 2\theta$
- $r^2 = 16 \sin 2\theta$
- $r^2 = 16 \cos 2\theta$

1. What affect does the value of a have on the graph of the function?
2. What affect does \sin and \cos have on the graph of the function?

Tests for Symmetry:

Symmetry w/ respect to the Polar axis (x-axis) if $f(-\theta) = f(\theta)$.

Symmetry w/ respect to the line $\theta = \frac{\pi}{2}$ (y-axis) if (r, θ) replaced with $(-r, -\theta)$ results in an equivalent equation.

Symmetry w/ respect to the pole (origin) if replacing r with $-r$ results in an equivalent equation.