

Math 124 Lesson Plan - Section 8.2 Graphs of Polar Equations

Sketching Graphs of polar equations:

Ex: equation $r=3$ is equation of all points 3 units away from the origin (or pole) equals a circle of radius 3 centered at the origin.

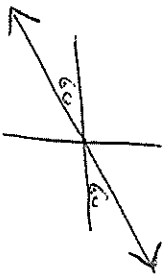
Can convert to rectangular and graph

$$r^2 = 9 \rightarrow x^2 + y^2 = 9$$

Ex: $\theta = \frac{\pi}{3} \rightarrow \tan \theta = \tan \frac{\pi}{3} \rightarrow \tan \theta = \sqrt{3}$

$$\rightarrow \frac{r \sin \theta}{r \cos \theta} = \sqrt{3} \rightarrow \frac{y}{x} = \sqrt{3} \rightarrow y = \sqrt{3}x$$

$$\theta = \frac{\pi}{3} =$$



Can use calculator for graphs of form

$r = \dots$ Calculator mode \rightarrow Graph = Polar
Angle = Radian.

To keep window in proportion x_{min} and x_{max} shall be double the y_{min} and y_{max} .

Basic General forms of equations are listed on page 594.

Circles, Spirals, Lissajous, Roses, Lemniscates

Tests of Symmetry for Polar Equations.

- 1) Symmetrical around the polar axis (like x-axis)
Replace θ with $-\theta$ results in unchanged equation.
- 2) Symmetrical around the Pole (like origin)
Replace r with $-r$ results in unchanged equation.
- 3) Symmetrical around line $\theta = \frac{\pi}{2}$ (like y-axis)
Replace θ with $\pi - \theta$ results in unchanged equation.

Ex: Find symmetries of $r = 3 \sec \theta$

(When change r to $-r \rightarrow$ make r positive (pole symmetry)
and change θ to $\theta + \pi$)

Add subtraction Formulas for Sine, Cosine.

$$\sin(a+b) = \sin a \cos b + \cos a \sin b$$

$$\sin(a-b) = \sin a \cos b - \cos a \sin b$$

$$\cos(a+b) = \cos a \cos b - \sin a \sin b$$

$$\cos(a-b) = \cos a \cos b + \sin a \sin b$$