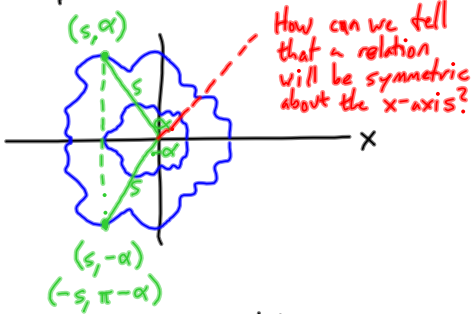
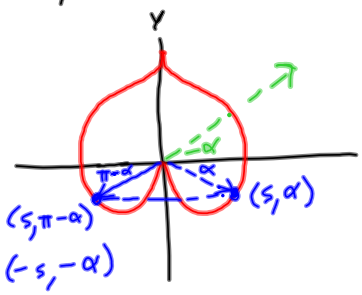
9.2 Graphing in Polar Coordinates

Symmetry about the x-axis



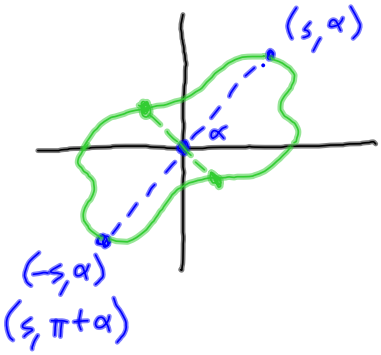
The graph of a polar relation is symmetric about the x-axis if and only if when $P(s,\alpha)$ is on the graph, so is $P(s,-\alpha) = P(-s,\pi-\alpha)$.

Symmetry about the y-axis



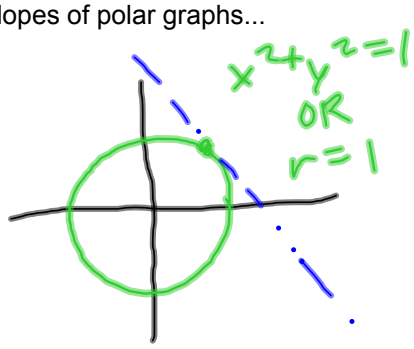
The graph of a polar relation is symmetric about the y-axis if and only if when $P(s,\alpha)$ is on the graph, so is $P(-s,-\alpha) = P(s,\pi-\alpha)$.

Rotational Symmetry about the origin.



The graph of a polar relation is symmetric about the origin if and only if when $P(s,\alpha)$ is on the graph, so is $P(-s,\alpha) = P(s,\pi+\alpha)$.

Slopes of polar graphs...



The slope of a tangent line to polar graph is still given by dy/dx.

More useful form:

$$\frac{dy}{dx} = \frac{dy/d\theta}{dx/d\theta}$$

$$= \frac{\frac{d}{d\theta}[y]}{\frac{d}{d\theta}[x]} \qquad y = r\sin\theta \qquad x = r\cos\theta$$

$$= \frac{\frac{d}{d\theta}[r\cdot\sin\theta]}{\frac{d}{d\theta}[r\cdot\cos\theta]}$$

$$= \frac{\frac{dr}{d\theta}\cdot\sin\theta + \cos\theta\cdot r}{\frac{dr}{d\theta}\cdot\cos\theta - \sin\theta\cdot r}$$

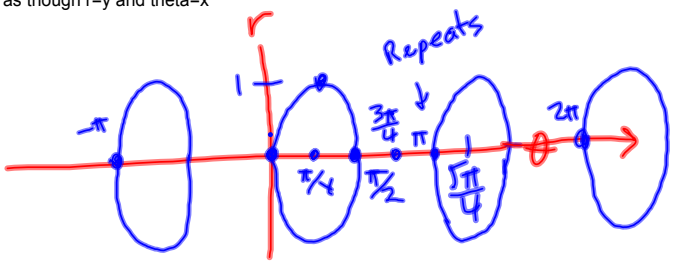
$$\boxed{\frac{dy}{dx} = \frac{\frac{dr}{d\theta}\sin\theta + r\cos\theta}{\frac{dr}{d\theta}\cos\theta - r\sin\theta}}$$

One straightforward technique for graphing a function.

Ex: $r^2 = \sin 2\theta$

$r = \pm\sqrt{\sin(2\theta)}$

1) Graph it as though r=y and theta=x



2) Use this as a guide to graph the polar version.