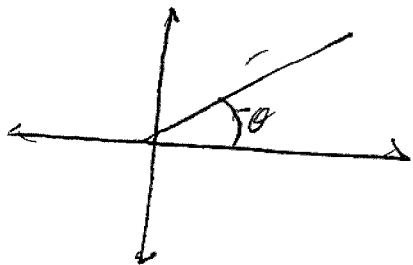


3/20/07

Review

Polar Coordinates



$$x = r \cos \theta \quad y = r \sin \theta$$

$$r = \sqrt{x^2 + y^2} \quad \theta = \tan^{-1} \left(\frac{y}{x} \right)$$

Problem Plot points w/ polar coordinates $(5, \pi/3)$, $(-2, -\pi/2)$, $(6, -3\pi)$

Problem $r=6$ $\theta = \pi/6$ convert to Cartesian

Problem Convert $(-6, 5)$ to polar coord.

Problem Sketch the following regions

1. $2 \leq r \leq 4$

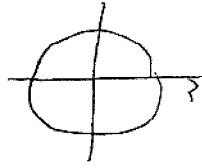
2. $1 < r < 3$, $\pi/2 < \theta \leq 3\pi/4$

3. $-1 \leq r \leq 1$, $0 \leq \theta \leq \pi/4$

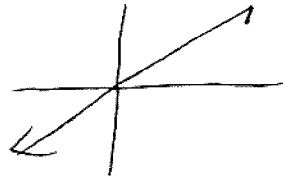
Polar Curves

Given an equation with r 's and θ 's, sketch graph of polar curve.

EX $r=2$

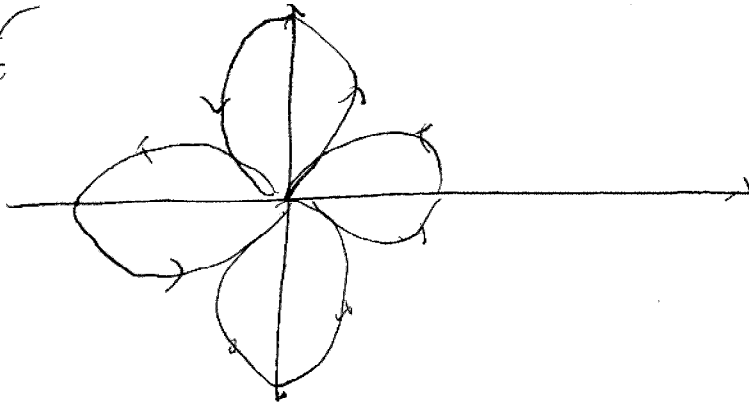
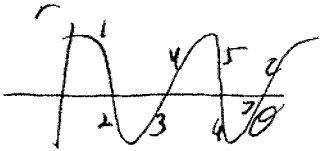


EX $\theta = \pi/4$



- originally a ray
- (negative, $\pi/4$)

Example sketch $r = \cos 2\theta$ $0 \leq \theta \leq 2\pi$



Sometimes easier to put in Cartesian Coord.

Ex 1. $r=2 \rightarrow x^2+y^2=2$ easy!

2. $\theta = \pi/4 \rightarrow \tan^{-1}(y/x) = \pi/4 \rightarrow y/x = 1 \rightarrow y = x$

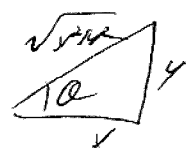
3. $r^2 - 3r + 2 = 0$

$x^2+y^2 - 3\sqrt{x^2+y^2} + 2 = 0$??



4. $r = 2 \cos \theta$

$\theta = \tan^{-1}(y/x)$



$\cos \theta = \frac{x}{\sqrt{x^2+y^2}}$

$\sqrt{x^2+y^2} = \frac{2x}{\sqrt{x^2+y^2}}$

$x^2+y^2 = 2x$

$x^2 - 2x + y^2 = 0$

$x^2 - 2x + 1 + y^2 = 1$

$(x-1)^2 + y^2 = 1$

circle!!

Tangent lines to Polar Curve

$$x = r \cos \theta \quad y = r \sin \theta$$

d

Suppose $r = f(\theta)$

$$x = f(\theta) \cos \theta$$

$$y = f(\theta) \sin \theta$$

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

HOR TANG: $\frac{dy}{d\theta} = 0$

VERT TANGENT $\frac{dx}{d\theta} = 0$

Examples

#47, 51