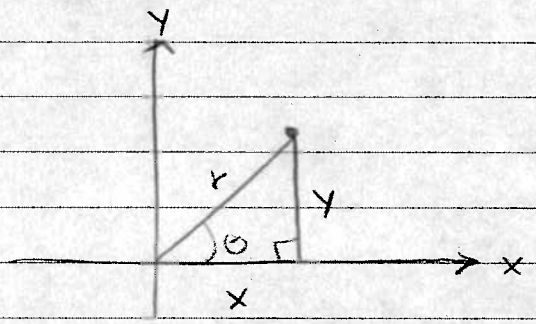
Some Random Title

Notes: 9.14.09

Outline
- Polar Polar Polar

Announcements
- September 22nd: math grad. school info discussion
- Tuesday October 6th: 5pm - 6pm Shape of Space
- Monday October 5th: Exam

★ Polar Stuff



(r, θ) polar coordinates

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

$x = r\cos\theta$

$y = r\sin\theta$

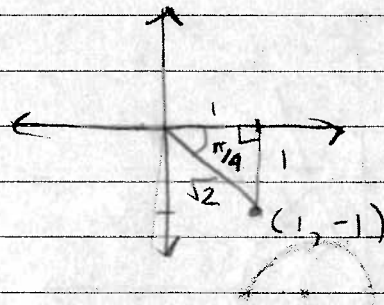
$y/x = \tan\theta$

ex) convert $(2\pi/3)$ into rectangular coordinates

$x = 2\cos\pi/3 = 1$

$y = 2\sin\pi/3 = \sqrt{3}$ $\rightarrow (1, \sqrt{3})$

ex) convert $(1, -1)$ to polar representation



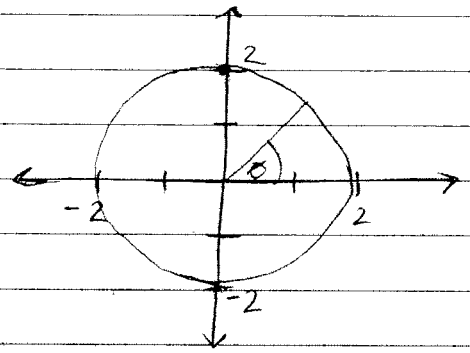
$\rightarrow (\sqrt{2}, -\pi/4)$ or $(\sqrt{2}, 7\pi/4)$

★ Polar Graphs

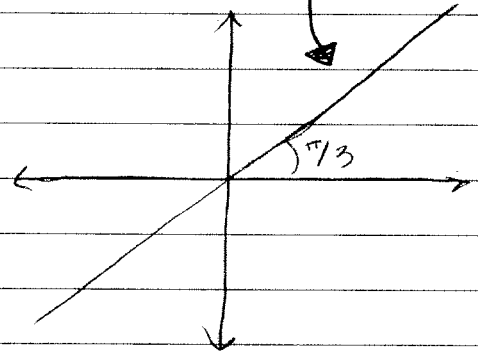
$r = f(\theta)$

or we might say $F(r, \theta) = 0$

ex| $r = 2$ $f(\theta) = 2$ ← "circle w/ radius of 2"



ex| $\theta = \pi/3$



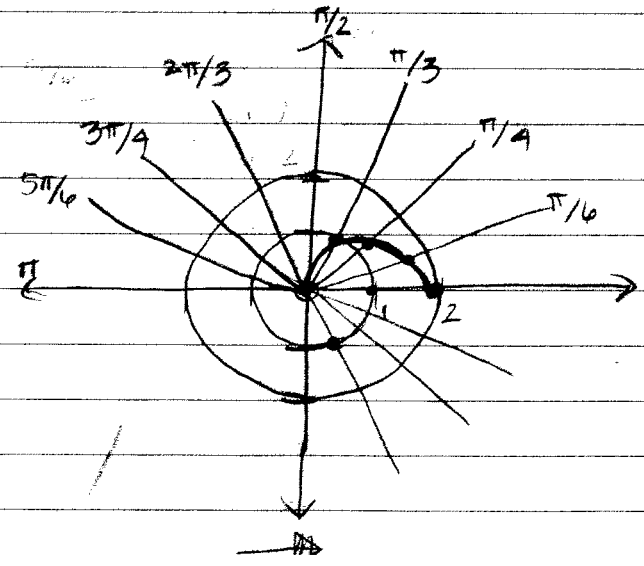
ex| $r = 2\cos\theta$

- sketch & find the equation for graph in rectangular coordinates.

- ways to sketch polar graphs

① plot points

θ	$r = 2\cos\theta$
0	2
$\pi/6$	$\sqrt{3}$
$\pi/4$	$\sqrt{2}$
$\pi/3$	1
$\pi/2$	0
$2\pi/3$	-1
$3\pi/4$	
$5\pi/6$	
π	



So... $r = 2\cos\theta$ is a circle with radius 1 centered @ $(1,0)$

Show this curve is a circle:

$r = 2\cos\theta$

we know:

$r^2 = x^2 + y^2$ → $r(r) = 2\cos\theta(r)$

$x = r\cos\theta$ ↓

$r^2 = 2r\cos\theta$

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

$x^2 - 2x + 1, \; y^2 = 0 + 1$ (complete the square)

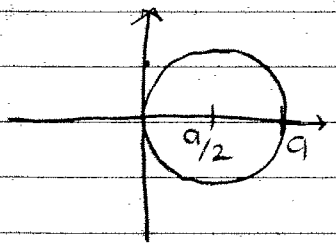
$(x-1)^2 + y^2 = 1$ ← equation of a circle with center $(1,0)$ & radius 1

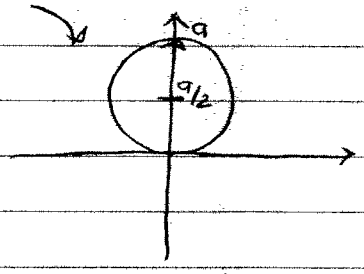
① FACT:

$r = a\cos\theta$ is a circle of radius $a/2$ centered @ $(a/2, 0)$

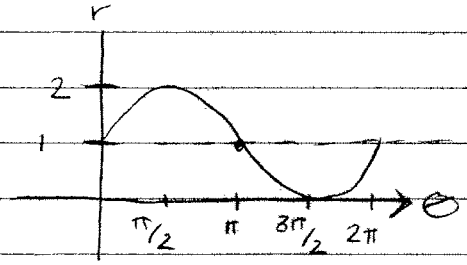
② FACT:

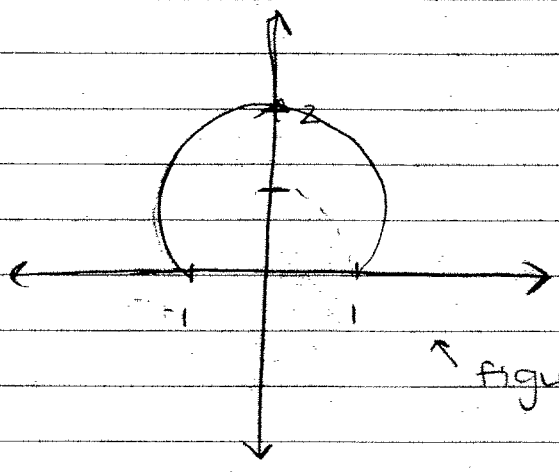
$r = a\sin\theta$ is a circle of radius $a/2$ centered @ $(0, a/2)$





② $r = 1 + \sin\theta$ sketch





↑ figure out!

EXAMPLE:

Show that $r = 4\cos\theta$ is a circle with radius 2.

$r^2 = x^2 + y^2$ $\rightarrow$ $r(r) = 4\cos\theta(r)$

$x = r\cos\theta$ $\qquad r^2 = 4r\cos\theta$

$x^2 + y^2 = 4x$

$x^2 - 4x + 4 + y^2 = 4 + 4$

$(x-2)(x-2)$

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

equation of a circle with radius 2 and center at $(2, 0)$