11.2 I #s 1, 2, 4, 5, 9, 11, 18, 25, 29

11.2 II #s 31, 32, 37, 38, 41, 44, 49, 51, 53, 57, 60 Tues

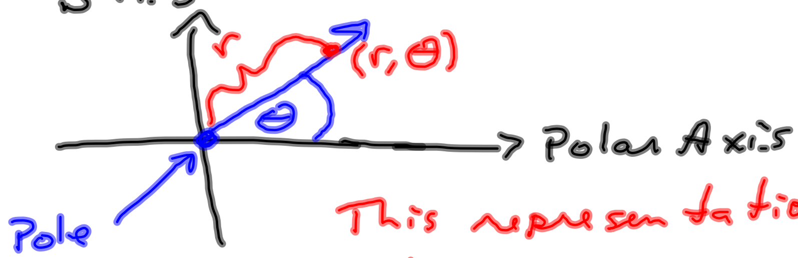
11.3 I #s 1, 3, 6, 8, 9, 14, 17, 20, 23, 26, 27, 29, 32, 40, 43 T/W

11.3 II #s 51, 55, 57, 60, 63, 66, 69, 71, 73, 77, 78

multiply both sides by r

Replace $r\sin\theta$ by y, etc.

§11.3 Polar Coordinate

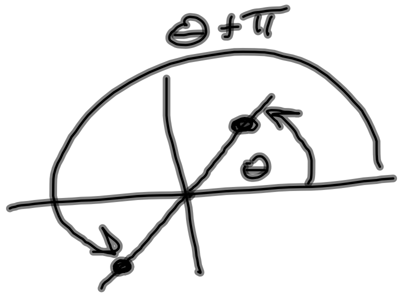


This representation is not unique.

(r, θ) can be located via

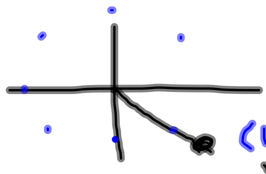
$(r, 2n\pi + \theta)$

$(-r, 2(n+1)\pi + \theta)$



#s 1,2 Find two duplicates w/ $r>0$, $r<0$

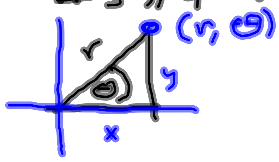
(2) (a) $(1, \frac{7\pi}{4})$



$(1, 7\pi/4)$" = "$(-1, \frac{3\pi}{4})$" = "$(1, \frac{-5\pi}{4})$

same location

#s 3,4 Plot. Find "Cartesians"



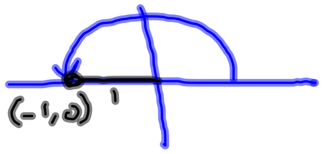
$x = r\cos\theta$

$y = r\sin\theta$

$\frac{y}{r} = \sin\theta$

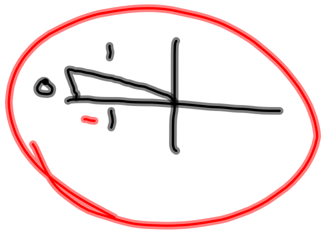
$\frac{x}{r} = \cos\theta$

(3) (a) $(1, \pi) \rightsquigarrow (-1, 0)$



$x = r\cos\theta$
$= 1\cos\pi$
$= -1$

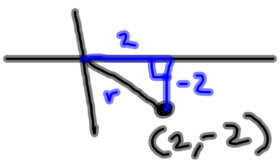
$y = r\sin\theta$
$= 1\sin\pi$
$= 1\cdot 0 = 0$



#s 5-6 Given Cartesians
(i) Find (r,θ) version, where $r>0$ & $0\le\theta<2\pi$
(ii) " " " " $r<0$ " "

(5) (a) $(2,-2)$

$r = \sqrt{2^2+(-2)^2} = \sqrt{8} = 2\sqrt{2}$



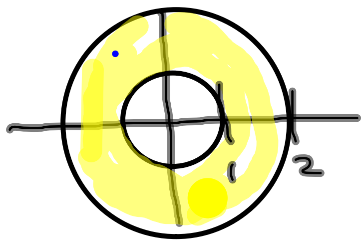
$x^2+y^2=r^2$

(i) $(2\sqrt{2}, \frac{7\pi}{4})$

(ii) $(-2\sqrt{2}, \frac{3\pi}{4})$

#5 7-12 Sketch

(7) $1 \le r \le 2$ is an ANNULUS.



Shaded Region

$\{(r,\theta) \mid 1 \le r \le 2\}$ is the region.

$1 \le r \le 2$ is the condition on all points in the region.

(13) Distance between $(2, \pi/3)$ & $(4, \frac{2\pi}{3})$

$x_1 = r_1 \cos\theta_1 = 2\cos\frac{\pi}{3}$ $y_1 = r_1 \sin\theta_1 = 2\sin\frac{\pi}{3}$

$x_2 = r_2 \cos\theta_2 = 4\cos(\frac{2\pi}{3})$ $y_2 = r_2 \sin\theta_2 = 4\sin\frac{2\pi}{3}$

$(x_1, y_1) = (1, \sqrt{3})$

$(x_2, y_2) = (-2, 2\sqrt{3})$

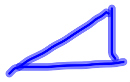
$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(-2-1)^2 + (2\sqrt{3} - \sqrt{3})^2}$

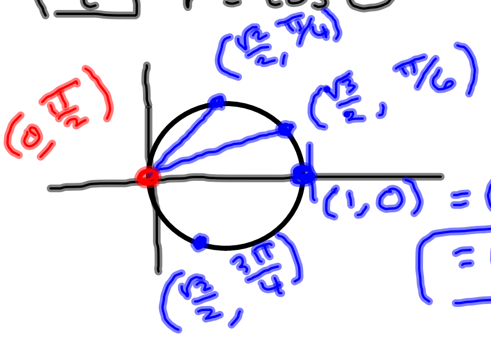
$= \sqrt{9 + 3} = \sqrt{12} = 2\sqrt{3}$

Graphs in Polar Coordinates

$r = f(\theta)$



E $r = \cos\theta$



$(1, 0) = (f(0), 0)$

$= (f(\pi), \pi) \to r = f(\theta) = \cos\theta$

$f(\pi) = -1$!?

$x = r\cos\theta$

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

$x = r^2$

$x^2 + y^2 = x$

$\tan\theta = \frac{y}{x}$

$x^2 - x + (\frac{1}{2})^2 + y^2 = 0 + \frac{1}{4}$

Aaron

$(x - \frac{1}{2})^2 + y^2 = \frac{1}{4}$

circle !?

Symmetry

Pg 680

$r = f(\theta)$ is even func. $\Rightarrow$ symmetric about polar axis. → x-axis

unchanged when r is replaced by $-r$.
Symmetric about pole

unchanged when θ replaced by $\pi - \theta$
symmetric about line $\theta = \frac{\pi}{2}$ → y-axis