day 61 : More polar coordinates

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

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

* make sure in right quadrant...

example:

$$r = 4 \sec \theta$$

convert to rectangular coord.

$$\frac{r}{\sec \theta} = 4$$

$$r \left(\frac{1}{\sec \theta}\right) = 4$$

$$r \cos \theta = 4$$

$$\boxed{x = 4}$$

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

example convert

$$(x-3)^2 + (y-2)^2 = 13$$

to polar form:

we want $r = ?$

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

$x = r\cos\theta$

$y = r\sin\theta$

$$x^2 - 6x + 9 + y^2 - 4y + 4 = 13$$

$$x^2 + y^2 - 6x - 4y = 0$$

$$r^2 - 6r\cos\theta - 4r\sin\theta = 0$$

$$r(r - 6\cos\theta - 4\sin\theta) = 0$$

$r = 0$

NO EXCITEMENT

$$r - 6\cos\theta - 4\sin\theta = 0$$

$$\boxed{r = 6\cos\theta + 4\sin\theta}$$

WS (6-4, HW from Friday night)

try #36, 43, 45, 47, 49

36) $y = -2$

43) $r = 2\sec\theta$

45) $r = 5/(2\cos\theta - 3\sin\theta)$

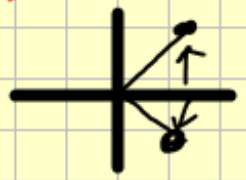
47) $r = 6\cos\theta$

49) $r = -6\cos\theta - 6\sin\theta$

Symmetry

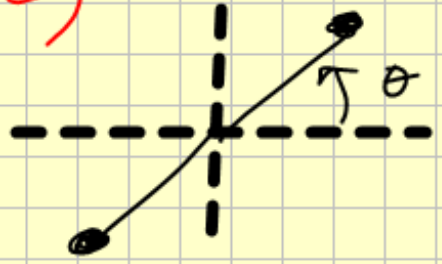
To show symm. algebraically

x-axis replace (r, θ) w/ $(r, -\theta)$



y-axis replace (r, θ) w/ $(-r, -\theta)$

origin (pole) replace (r, θ) w/ $(-r, \theta)$



$y = \sin\theta$

$\sin\theta = \sin(-\theta)$

$$r = 3 \sin 4\theta$$

$$r = 3 \sin 4(-\theta)$$

$$r = 3 \sin(-4\theta)$$

$\therefore$ sin is an even fn.

$\sin(\theta) = \sin(-\theta)$

$$r = 3 \sin 4\theta$$

see formulas on page

~~250~~ (?)

240 (according to Sam)

Show that $r = 3\sin 4\theta$ symmetric about x axis.

$$r = 3\sin 4\theta$$