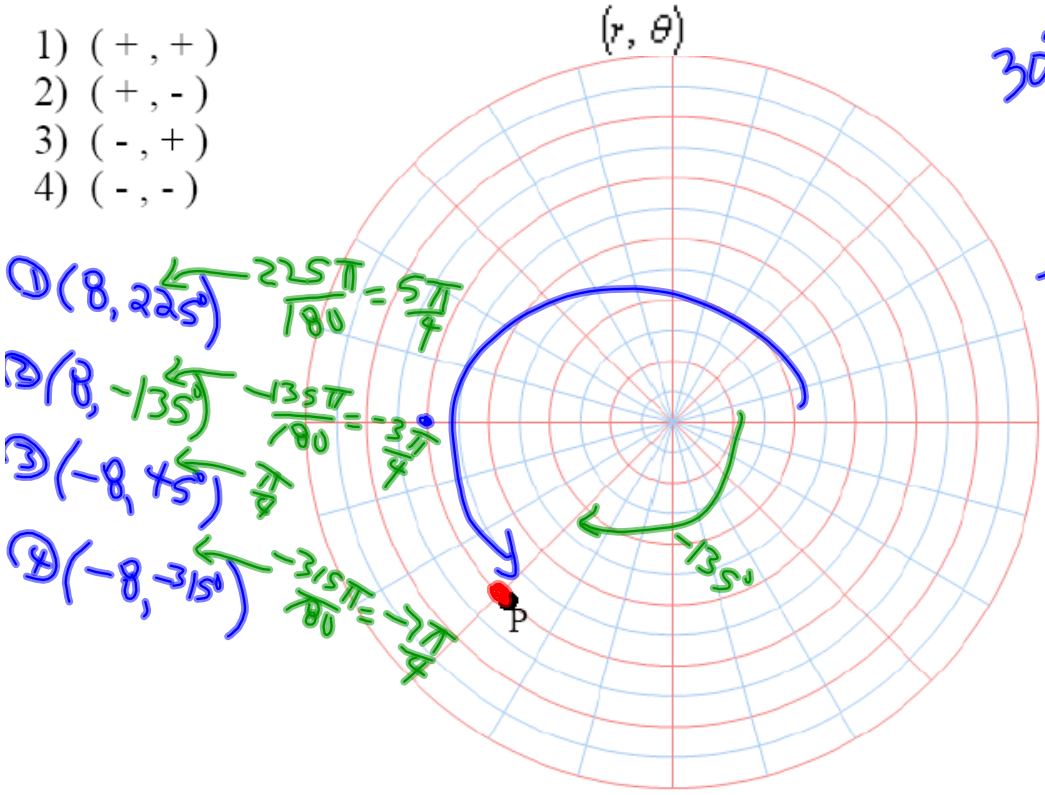
WARM-UP...

State 4 coordinates that describe the point P in BOTH rads & deg...

1) (+ , +)
2) (+ , -)
3) (- , +)
4) (- , -)



$\pi = 180°$

$30° = \frac{30\pi}{180} = \frac{\pi}{6}$

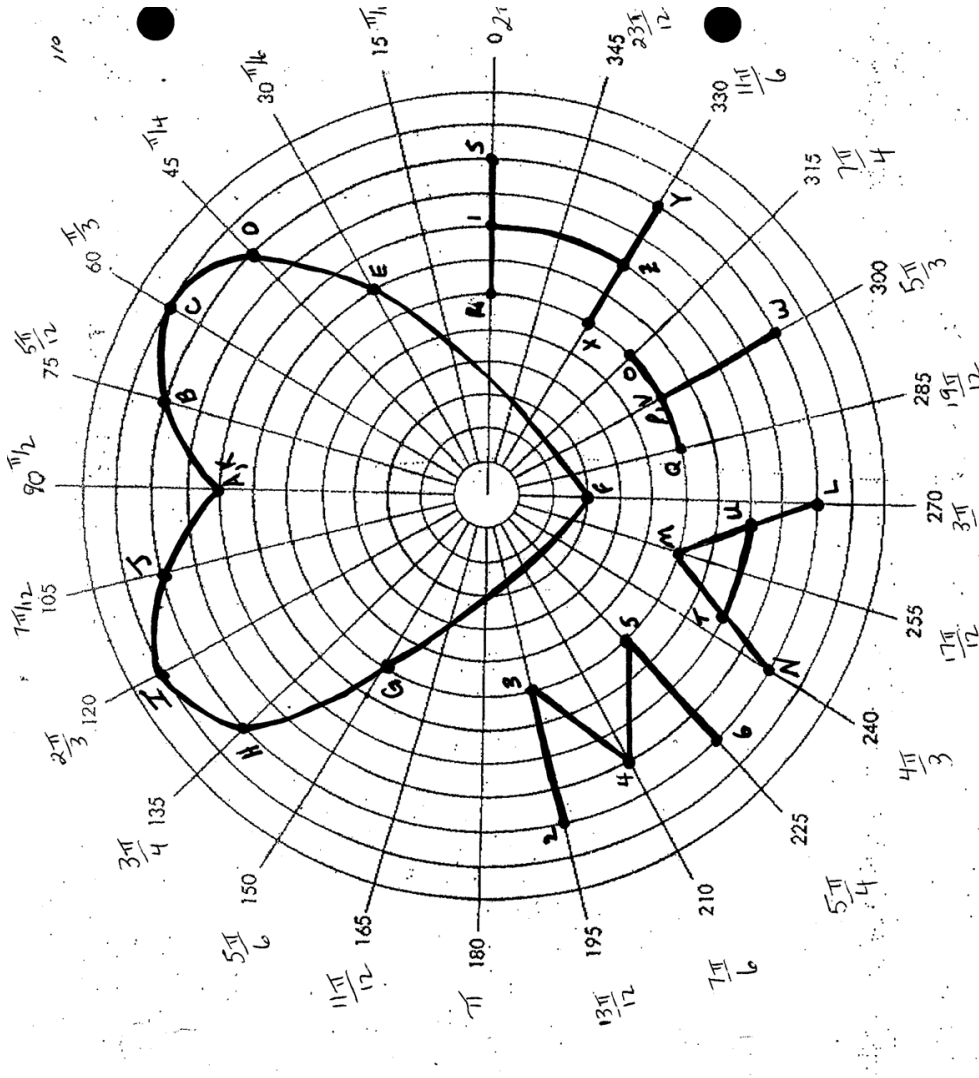
$71° = \frac{71\pi}{180}$

① $(8, 225°)$ $\frac{225\pi}{180} = \frac{5\pi}{4}$

② $(8, -135°)$ $\frac{-135\pi}{180} = -\frac{3\pi}{4}$

③ $(-8, 45°)$ $\frac{\pi}{4}$

④ $(-8, -315°)$ $\frac{-315\pi}{180} = -\frac{7\pi}{4}$



Check Your Understanding

4. Create a picture by plotting and connecting the following points.

(a) Join these points with a smooth curve.

$\left(8, \frac{\pi}{2}\right), \left(10, \frac{5\pi}{12}\right), \left(11, \frac{\pi}{3}\right), \left(-10, \frac{5\pi}{4}\right), \left(7, \frac{\pi}{6}\right), \left(3, -\frac{\pi}{2}\right), \left(7, -\frac{7\pi}{6}\right),$
$\left(10, \frac{3\pi}{4}\right), \left(-11, -\frac{\pi}{3}\right), \left(10, \frac{7\pi}{12}\right), \left(-8, \frac{3\pi}{2}\right)$

(b) Connect these points with straight lines in the order given.

$\left(10, \frac{7\pi}{2}\right), \left(-6, \frac{5\pi}{12}\right), \left(10, -\frac{8\pi}{3}\right)$

(c) Join these points with a smooth curve.

$\left(6, \frac{15\pi}{4}\right), \left(-6, \frac{14\pi}{3}\right), \left(6, -\frac{5\pi}{12}\right)$

(d) Join these points with a straight line.

$(6, 0), (-10, -5\pi)$

(e) Join these points with a smooth curve.

$(8, 245°), (8, 265°)$

(f) Join these points with a straight line.

$(-6, -240°), (10, -60°)$

(g) Join these points with a straight line.

$\left(6, \frac{23\pi}{6}\right), \left(10, -\frac{\pi}{6}\right)$

(h) Join these points with a smooth curve.

$(8, 690°), (8, 6\pi)$

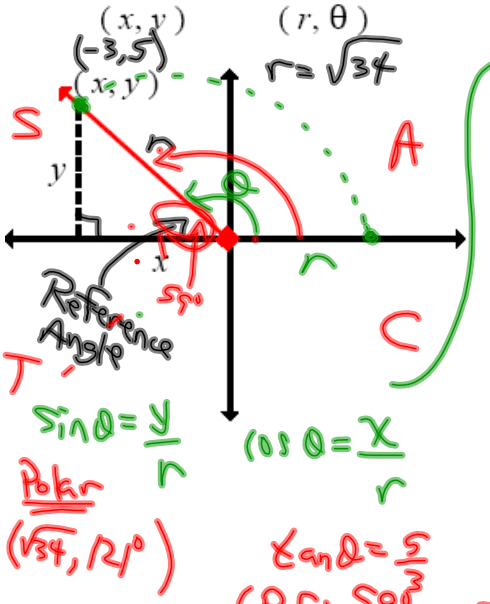
(i) Connect these points with straight lines in the order given.

$\left(10, \frac{13\pi}{12}\right), \left(-6, \frac{\pi}{12}\right), \left(9, -\frac{5\pi}{6}\right), \left(6, \frac{13\pi}{4}\right), \left(-10, -\frac{7\pi}{4}\right)$

Converting Between Coordinate Systems

I. Rectangular ⇒ Polar

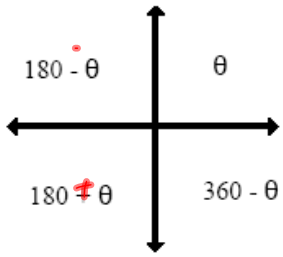
(x, y) (r, θ)



To get θ we know that...

$$\tan\theta = \left|\frac{y}{x}\right|$$

to get the reference angle then we put it into the quadrant where the point lies.

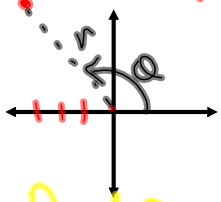


To get r we know that...

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

EXAMPLES...

#1. (-3, 6)



Quad. 2

$r = \sqrt{9+36}$

$r = \sqrt{45}$

$r = 3\sqrt{5}$

$\tan\theta = \frac{6}{3} = 2$

(Ref $\angle = 63°$, Q2)

$\theta = 117°$

$(3\sqrt{5}, 117°)$

* Prior Knowledge

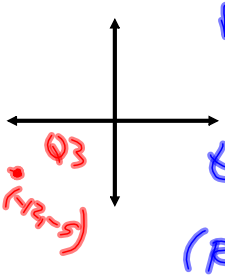
$r = \sqrt{x^2+y^2}$

Ref $\angle$

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

$180-\theta$	θ
$180+\theta$	$360-\theta$

#2. (-12, -5)



$r = \sqrt{144+25}$

$r = 13$

$\tan\theta = \frac{5}{12}$

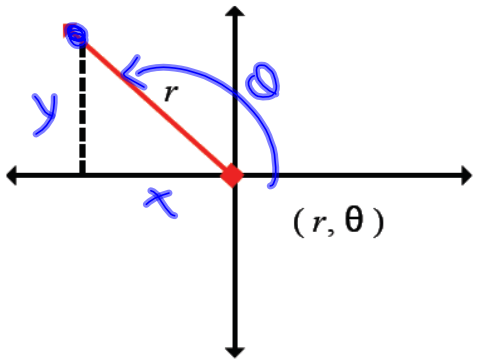
(Ref $\angle = 23°$, Q3)

$(13, 203°)$

II. Polar ⇒ Rectangular

(r, θ) (x, y)

FORMULA!!!

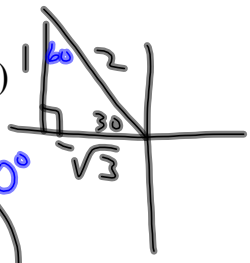


$$\cos\theta = \frac{x}{r} \quad so \quad x = r\cos\theta$$

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

Examples...

#1. $(3, 150^\circ)$ (r, θ)



$x = 3\cos 150^\circ$

$x = 3\left(\frac{-\sqrt{3}}{2}\right)$

$x = \frac{-3\sqrt{3}}{2}$

$y = 3\sin 150^\circ$

$y = 3\left(\frac{1}{2}\right)$

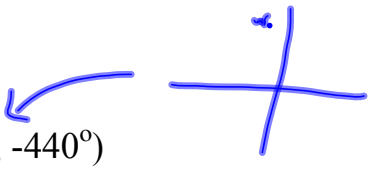
$y = \frac{3}{2}$

$\left(\frac{-3\sqrt{3}}{2}, \frac{3}{2}\right)$

OR

$(-2.6, 1.5)$

#2. $(-5, -440^\circ)$



$x = -5\cos(-440)$

$x = -0.87$

$y = -5\sin(-440)$

$= 4.9$

$(-.87, 4.9)$

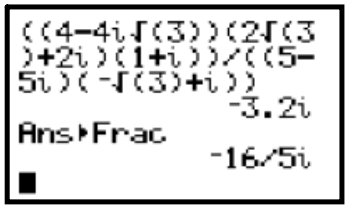
Homework...

Worksheet - Converting Polar_Rectangular Coordinates.doc

Do questions #14, 15

BONUS

EXERCISE: Express the following in the form "a + b*i*"...



$$\frac{\left(4-4i\sqrt{3}\right)\left(2\sqrt{3}+2i\right)\left(1+i\right)}{\left(5-5i\right)\left(-\sqrt{3}+i\right)} = \frac{-16}{5}i$$

Attachments

Worksheet - Converting Polar_Rectangular Coordinates.doc