Trig 9.3

Convert between polar and rectangular coordinates

rectangular coordinates

polar coordinates

cosine

sine

hypotenuse

tangent, inverse tangent

whiteboards

(r, θ)

(x, y)

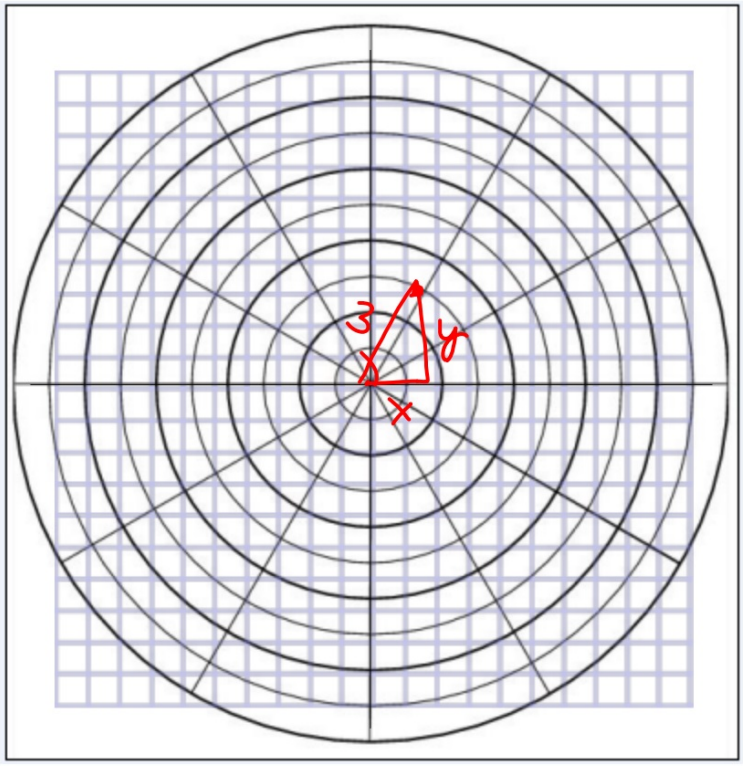
Quiz 9.1-9.2

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

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

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

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



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$(3, 45^\circ)$

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

$\sin 45 = \frac{y}{3}$

$3\sin 45 = y$

$\frac{3\sqrt{2}}{2}$

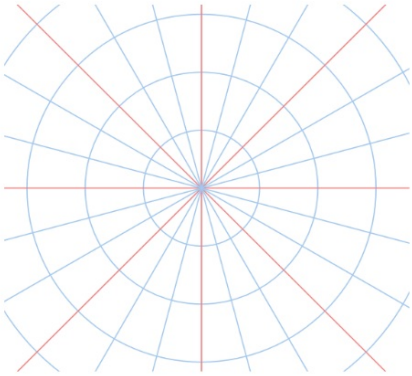
$\cos 45 = \frac{x}{3}$

$3\cos 45 = x$

$\frac{3\sqrt{2}}{2}$

Right triangle:
cos=
sin=

In a polar coord. system:



Converting Polar Coordinates to Rectangular Coordinates

The rectangular coordinates (x, y) of a point named by the polar coordinates (r, θ) can be found by using the following formulas.

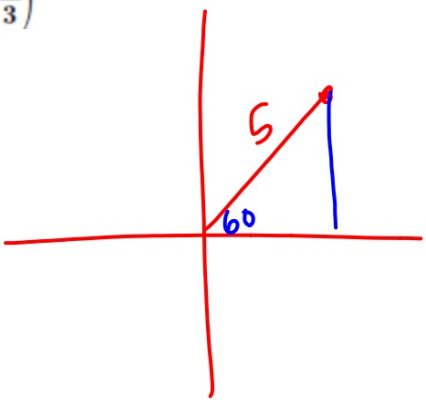
$$x = r\cos\theta$$
$$y = r\sin\theta$$

$(r, \theta) \leftrightarrow (x, y)$

Use exact answers when handy angles

1 **Find the rectangular coordinates of each point.**

a. $P\left(5, \frac{\pi}{3}\right)$



$x = 5\cos 60$

$5 \cdot \frac{1}{2} = \frac{5}{2}$

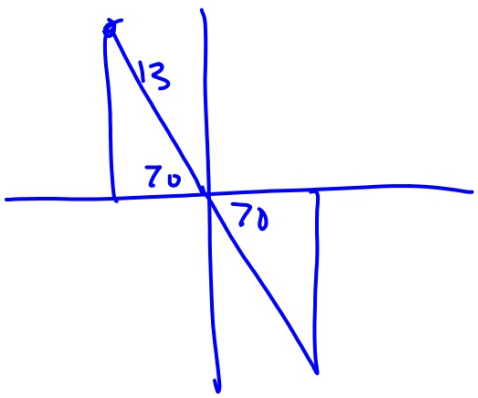
$\left(\frac{5}{2}, \frac{5\sqrt{3}}{2}\right)$

$y = 5\sin 60$

$5 \cdot \frac{\sqrt{3}}{2} = \frac{5\sqrt{3}}{2}$

decimal answers when not handy angles

b. $Q(-13, -70^\circ)$



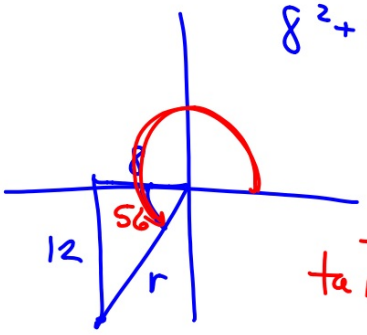
$x = 13\cos 70 \approx 4.4$

$y = 13\sin 70 \approx 12.2$

$(-4.4, 12.2)$

(r, θ)

3 Find the polar coordinates of $R(-8, -12)$.



$8^2 + 12^2 =$

$\tan^{-1}\left(\frac{12}{8}\right)$

Use reference angles if not in Q1
sketch first...

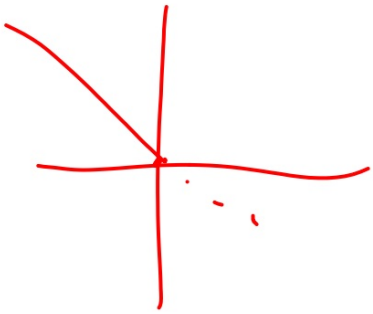
$(14.4,\ 236^\circ)$

exact answers when handy angles

Find the polar coordinates of each point with the given rectangular coordinates.
Use $0 \le \theta < 2\pi$ and $r \ge 0$.

5. $\left(-\sqrt{2}, \sqrt{2}\right)$

6. $(-2, -5)$



Tiny little parking lot...

$y=r\sin\theta$

$x=r\cos\theta$

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

9.3

13-39 odd

25

rectangular: x's y's polar: r's sin cos

Examples **4** **Write the polar equation $r = 6 \cos \theta$ in rectangular form.**

$r = 6 \cos \theta$

Goal: r, sin, cos ….out
x, y …in

Write each polar equation in rectangular form.

11. $r = 6$

12. $r = -\sec\theta$

sec = 1/cos

EWE

5 **Write the rectangular equation $(x - 3)^2 + y^2 = 9$ in polar form.**

Write each rectangular equation in polar form.

9. $y = 2$

10. $x^2 + y^2 = 16$