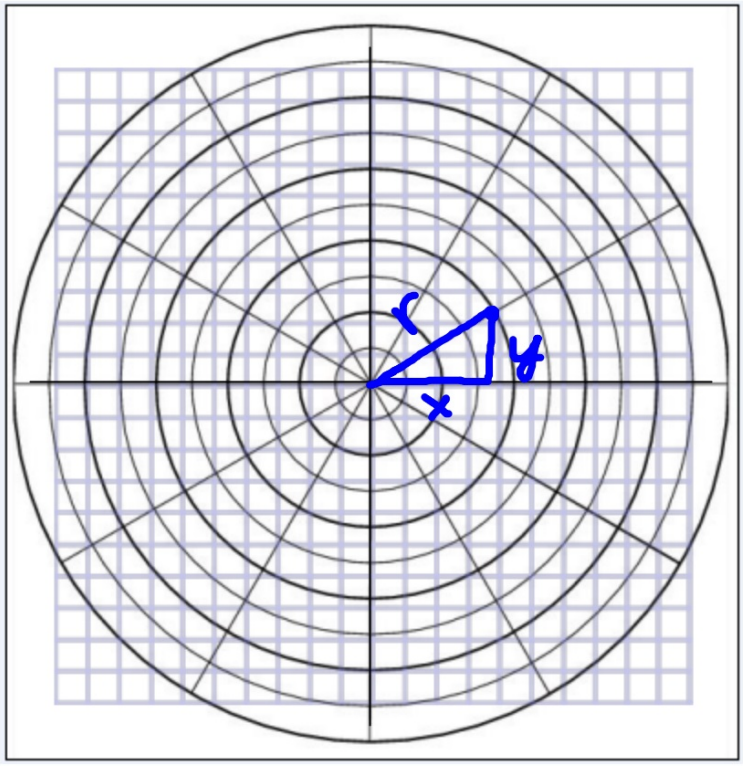


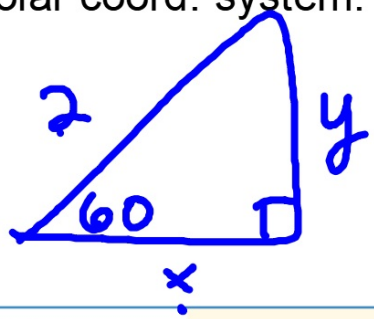
<<<

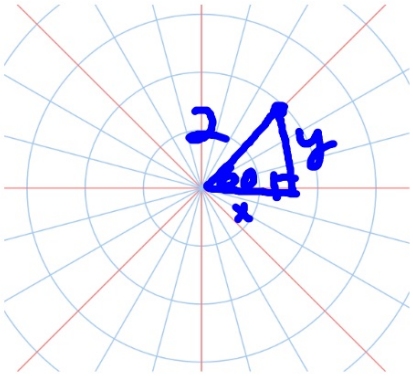
(r, θ)

(x, y)

Right triangle:
cos=
sin=

In a polar coord. system:





$(1, \sqrt{3})$

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.

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

$\cos 60 = \frac{x}{2}$

$x = 2\cos 60$

$\sin 60 = \frac{y}{2}$

$y = 2\sin 60$

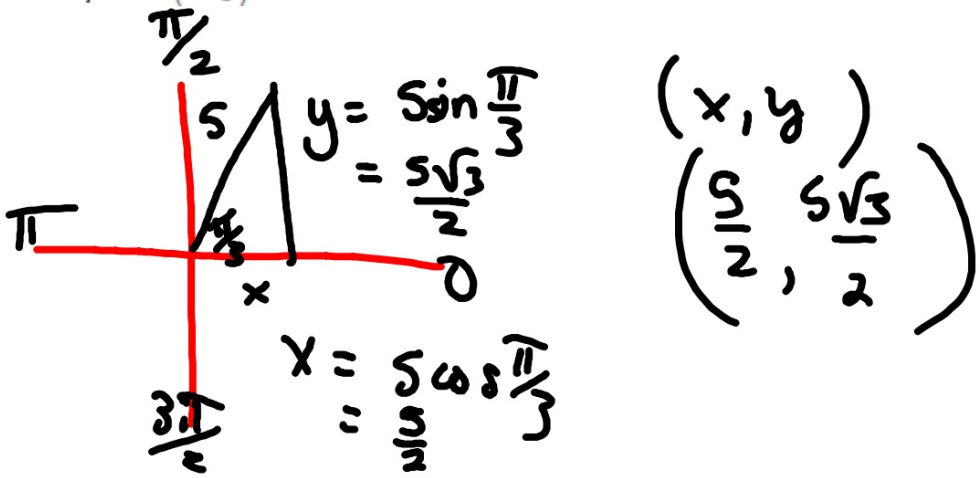
$= 2 \cdot \frac{\sqrt{3}}{2} = \sqrt{3}$

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

Use exact answers when handy angles

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

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

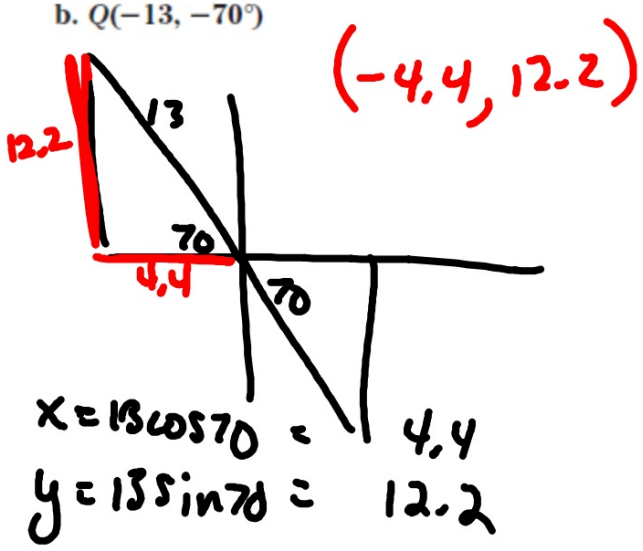


(x, y)

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

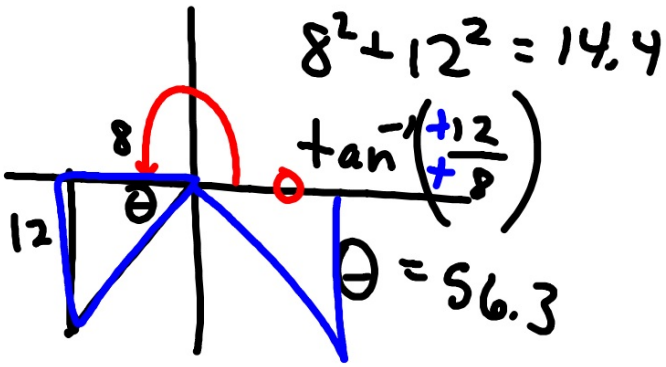
decimal answers when not handy angles

b. $Q(-13, -70°)$



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

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

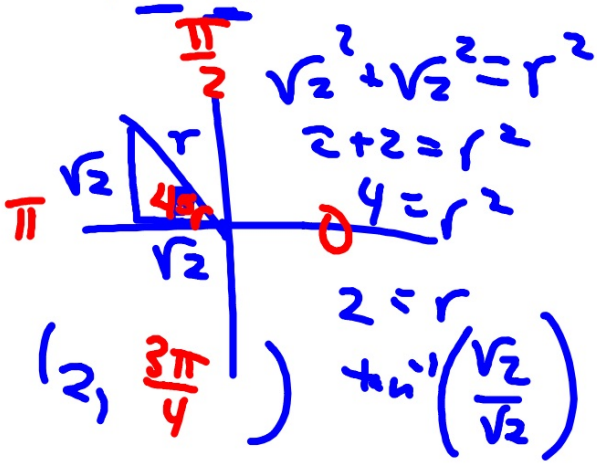


$(14.4, 236.3°)$

exact answers when handy angles

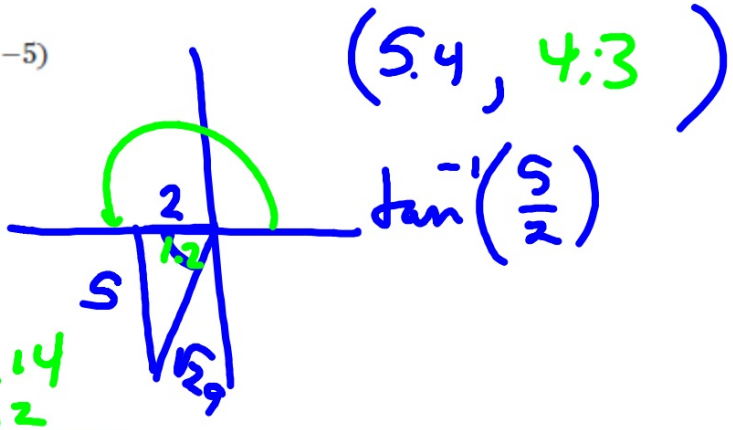
Find the polar coordinates of each point with the given rectangular coordinates.
Use $0 \le \theta < 2\pi$ and $r \ge 0$.

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



$\frac{4\pi}{4} - \frac{\pi}{4}$

6. $(-2, -5)$



3.14
1.2
4.3

Tiny little parking lot...

- $y=r\sin\theta$
- $x=r\cos\theta$
- $x^2 + y^2 = r^2$

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

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

$r = 6 \cos \theta$

$r = 6\cos\theta$

$r^2 = 6r\cos\theta$ $\quad r^2 = 36\cos^2\theta$

Goal: r, sin, cos ....out
x, y ...in

$x^2+y^2 = 6x$

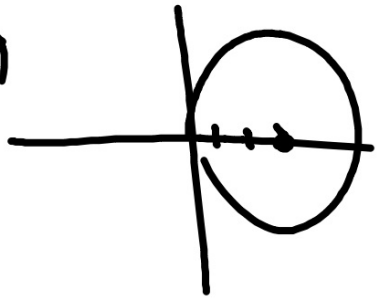
$x = r\cos\theta$
$y = r\sin\theta$
$x^2+y^2 = r^2$

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

$(x^2-6x+9)+y^2 = 9$

$(x-3)^2+y^2 = 9$

$(3,0)$ $\quad r=3$



Write each polar equation in rectangular form.

11. $r = 6$

12. $r = -\sec\theta$

sec = 1/cos

$r^2 = 36$

$x^2 + y^2 = 36$

15-330

$x = r\cos\theta$

$y = r\sin\theta$

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

EWE

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

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

$-9 \quad -9$

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

$x=r\cos\theta$

$y=r\sin\theta$

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

$r^2-6x=0$

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

$\frac{r}{r} \quad r$

$r-6\cos\theta=0$

$r=6\cos\theta$

-1

Write each rectangular equation in polar form.

9. $y = 2$

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