

We omitted #52.

Remember HW Key is online.

GHW#14 is due Friday.

End of Ch 9 Quiz next Monday.

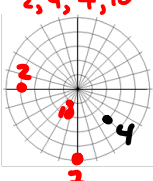
Try 3 question warm-up.

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2, 4, 7, 10

4) $(-3, \frac{135\pi}{180})$
 $(-3, \frac{3\pi}{4})$
 Change to radians



18) $(2, \frac{\pi}{6})$
 20) $(4, \frac{\pi}{6})$
 22) $(6, \frac{2\pi}{3})$
 24) $(1, \frac{3\pi}{2})$

26) $(3, \frac{4\pi}{3})$ 52)
 29) $(4.643, 2.320)$
 41) $r = \frac{5}{\cos \theta} \rightarrow r = 5 \sec \theta$
 * 51) $r = \pm 6$

13) a) $(4, \frac{\pi}{4})(4, -\frac{\pi}{4})(-4, \frac{7\pi}{6})(-4, -\frac{5\pi}{6})$
 b) $\frac{300^\circ}{5} \rightarrow 5 \frac{\pi}{3}$
 $(5, \frac{5\pi}{3})(5, -\frac{\pi}{3})(-5, \frac{2\pi}{3})(-5, -\frac{4\pi}{3})$
 c) $\frac{150^\circ}{2} \rightarrow 5 \frac{\pi}{6}$
 $(2, \frac{5\pi}{6})(2, -\frac{7\pi}{6})(-2, \frac{11\pi}{6})(-2, -\frac{\pi}{6})$

2a) $(-10, 3.4) \rightarrow (r, \theta)$
 $r = \sqrt{(-10)^2 + (3.4)^2}$
 $r = \sqrt{21.56}$
 $r = 4.643$
 $\tan \theta = \frac{3.4}{-10}$
 $\theta = \tan^{-1}(\frac{3.4}{-10}) = .826079$
 $\theta_{II} = \pi - \theta = 2.320$
 $(4.643, 2.320)$

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Polar to Rectangular

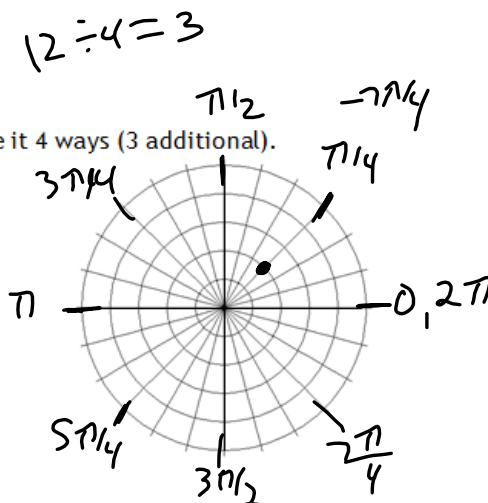
Warm-Up. Plot the point and name it 4 ways (3 additional).

$$\left(2, -\frac{7\pi}{4}\right)$$

$$(2, \pi/4)$$

$$(-2, 5\pi/4)$$

$$(-2, -3\pi/4)$$

PreCalc
Ch 9 Day 3

Convert the following Rectangular coordinates to Polar coordinates:

a) $(-5, 5) = (r, \theta)$

$$(5\sqrt{2}, \frac{3\pi}{4})$$

$$r = \sqrt{25+25} \quad \tan \theta = \frac{5}{-5} = -1$$

$$r = \sqrt{50} \quad \alpha = \pi/4$$

$$r = 5\sqrt{2} \quad \text{II: } \theta = \pi - \frac{\pi}{4} = \frac{3\pi}{4}$$

b) $(-3, -\sqrt{3}) = (r, \theta)$

$$(2\sqrt{3}, \frac{7\pi}{6})$$

$$r = \sqrt{9+3} \quad \tan \theta = \frac{-\sqrt{3}}{-3} = \frac{\sqrt{3}}{3}$$

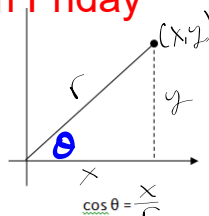
$$r = \sqrt{12} \quad \alpha = \frac{\pi}{6}$$

$$r = 2\sqrt{3} \quad \text{III: } \theta = \pi + \frac{\pi}{6}$$

$$\theta = 7\pi/6$$

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From Friday



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

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

$$\tan \theta = y/x$$

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

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

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

Converting Rectangular Coordinates to Polar Coordinates:

Steps:

Plot the point first!

1) Find r using $r^2 = x^2 + y^2$ $r = \sqrt{x^2 + y^2}$ 2) Use $\tan \theta = \frac{y}{x}$ to find reference angle for θ

3) Determine the quadrant the angle is in by looking at your plotted point and find the angle

4) Write answer in the form (r, θ)

Convert the rectangular coordinates to polar coordinates:

1. $(-1, 1) = (r, \theta)$

$$(r, \theta) = (1, \frac{3\pi}{4})$$

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

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

$$r = \sqrt{1+1} = \sqrt{2}$$

$$\textcircled{3} \tan \theta = \frac{y}{x} = \frac{1}{-1} = -1$$

in Q II

$$\alpha = \frac{\pi}{4}$$

$$(-1, 1) \rightarrow \text{Q II}$$

$$\theta = \pi - \frac{\pi}{4} = \frac{3\pi}{4}$$

2. $(0, -5) = (r, \theta)$

$$(r, \theta) = (5, \frac{3\pi}{2})$$

$$r = \sqrt{0^2 + (-5)^2}$$

$$r = \sqrt{25} = 5$$

$$\tan \theta = \frac{y}{x} = \frac{-5}{0} = \text{undefined}$$

$$\frac{\pi}{2} \quad \frac{3\pi}{2}$$

$$(r, \theta) = (5, \frac{3\pi}{2})$$

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Need special & chart

Converting Polar Coordinates to Rectangular Coordinates: (r, θ) to (x, y)

Steps

1) Graph the angle in the appropriate quadrant: Determine the correct sign for cosine and sin of the angle

2) Use the following relationships to solve for x and y

$$x = r \cos \theta \quad \text{and} \quad y = r \sin \theta$$

Convert each of the following from polar coordinates, which the angle is given in radians, to rectangular coordinates. Give exact answers if possible; otherwise, round to the nearest thousandth.

1. $(4, \pi) \rightarrow (x, y) = (-4, 0)$

(3 decimals)

$x = r \cos \theta$
 $x = 4 \cos \pi$
 $x = 4(-1)$
 $x = -4$

$y = r \sin \theta$
 $y = 4 \sin \pi$
 $y = 4(0)$
 $y = 0$

2. $(-2, \frac{3\pi}{4}) \rightarrow (x, y) = (\sqrt{2}, -\sqrt{2})$

$x = r \cos \theta$
 $x = -2 \cos \frac{3\pi}{4}$
 $x = -2(-\frac{\sqrt{2}}{2})$
 $x = \frac{2\sqrt{2}}{2} = \sqrt{2}$

$y = r \sin \theta$
 $y = -2 \sin \frac{3\pi}{4}$
 $y = -2(+\frac{\sqrt{2}}{2})$
 $y = -2(\frac{\sqrt{2}}{2})$
 $y = -\sqrt{2}$

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3. $(4, \frac{4\pi}{3}) \rightarrow (x, y) = (-2, 2\sqrt{3})$

$x = r \cos \theta$
 $x = 4 \cos \frac{4\pi}{3}$
 $x = 4(-\frac{1}{2})$
 $x = 4(-\frac{1}{2})$
 $x = -2$

$y = r \sin \theta$
 $y = 4 \sin \frac{4\pi}{3}$
 $y = 4(+\frac{\sqrt{3}}{2})$
 $y = 4(\frac{\sqrt{3}}{2})$
 $y = 2\sqrt{3}$

4. $(3, \frac{5\pi}{6}) \rightarrow (x, y) = (-\frac{3\sqrt{3}}{2}, \frac{3}{2})$

$x = r \cos \theta$
 $x = 3 \cos \frac{5\pi}{6}$
 $x = 3(-\frac{\sqrt{3}}{2})$
 $x = -\frac{3\sqrt{3}}{2}$

$y = r \sin \theta$
 $y = 3 \sin \frac{5\pi}{6}$
 $y = 3(\frac{1}{2})$
 $y = \frac{3}{2}$

5. $(-2.904, -0.907) \rightarrow (x, y) = (-1.789, 2.287)$

$x = -2.904 \cos(-0.907)$
 $x = -1.789$

$y = -2.904 \sin(-0.907)$
 $y = 2.287$

6. $(-5, \frac{3\pi}{2}) \rightarrow (x, y) = (0, 5)$

$x = -5 \cos \frac{3\pi}{2}$
 $x = -5(0)$
 $x = 0$

$y = -5 \sin \frac{3\pi}{2}$
 $y = -5(-1)$
 $y = 5$

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r, θ x, y
POLAR FORM TO RECTANGULAR FORM

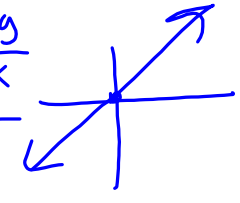
REPLACEMENTS $r = \sqrt{x^2 + y^2}$ $\theta = \tan^{-1} \left| \frac{y}{x} \right|$ $x = r \cos \theta$ $y = r \sin \theta$

Convert from Polar equation to rectangular form:

$r = -5$
 $(r \cos \theta)^2 = (-5)^2$
 $x^2 + y^2 = 25$
 Circle

$r \sin \theta = 4$
 $y = 4$

$\theta = \frac{\pi}{4}$
 $\tan^{-1} \left(\frac{y}{x} \right) = \frac{\pi}{4}$
 $\tan \frac{\pi}{4} = \frac{y}{x}$
 $1 = \frac{y}{x}$
 $y = x$



$r = \sec \theta$
 $\frac{r}{1} = \frac{1}{\cos \theta}$
 $r \cos \theta = 1$
 $x = 1$

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