

Happy National Dice Day!

- Park your phones
- Grab calculators
- Take out HW from last night
- Start warmup



Honors Pre-Calculus

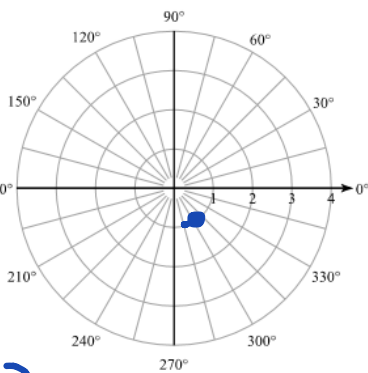
Name _____

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Polar Warmup

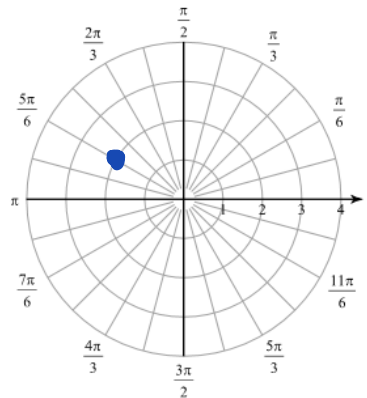
Plot the point with the given polar coordinates. Then, give the other 3 names for each point

1) $(1, 300^\circ)$



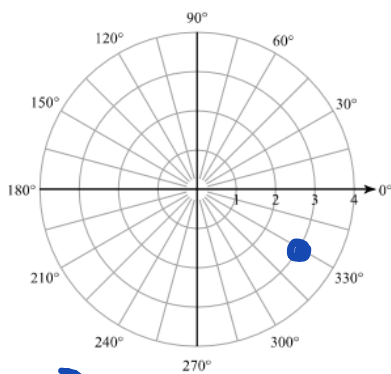
$(1, -60^\circ)$
 $(-1, 120^\circ)$
 $(-1, -240^\circ)$

2) $(2, \frac{5\pi}{6})$



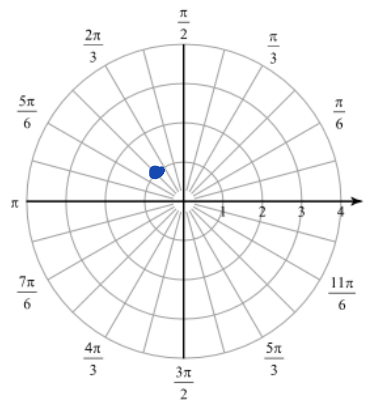
$(2, -\frac{7\pi}{6})$
 $(-2, \frac{11\pi}{6})$
 $(-2, -\frac{\pi}{6})$

3) $(3, -30^\circ)$



$(3, 330^\circ)$
 $(-3, 150^\circ)$
 $(-3, -210^\circ)$

4) $(-1, \frac{7\pi}{4})$



$(1, \frac{3\pi}{4})$
 $(-1, -\frac{\pi}{4})$
 $(1, -\frac{5\pi}{4})$

$$x = r \cdot \cos \theta$$

$$y = r \cdot \sin \theta$$

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

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

Convert each pair of polar coordinates to rectangular coordinates.

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

6) $(-4, 225^\circ)$

$$(0, 2)$$

$$(2\sqrt{2}, 2\sqrt{2})$$

7) $(-1, 60^\circ)$

8) $\left(3, \frac{11\pi}{6}\right)$

$$x = 3 \cos \left(\frac{11\pi}{6}\right)$$

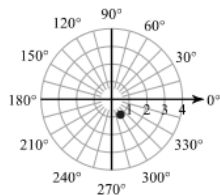
$$y = 3 \sin \left(\frac{11\pi}{6}\right)$$

$$\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$$

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

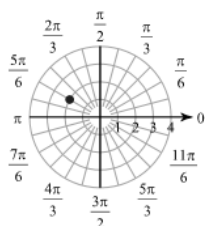
Answers to Polar Warmup

1)



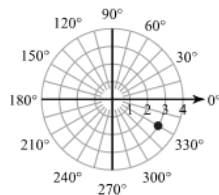
5) $(0, 2)$

2)



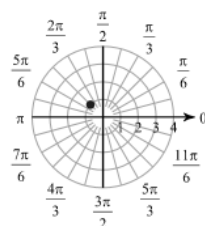
6) $(2\sqrt{2}, 2\sqrt{2})$

3)



7) $\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$

4)



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

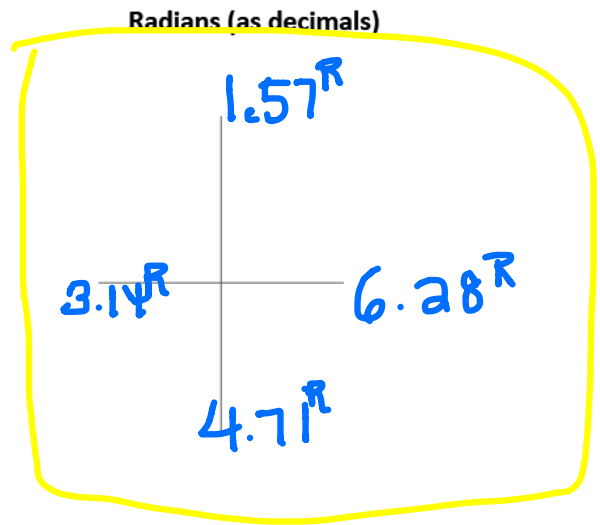
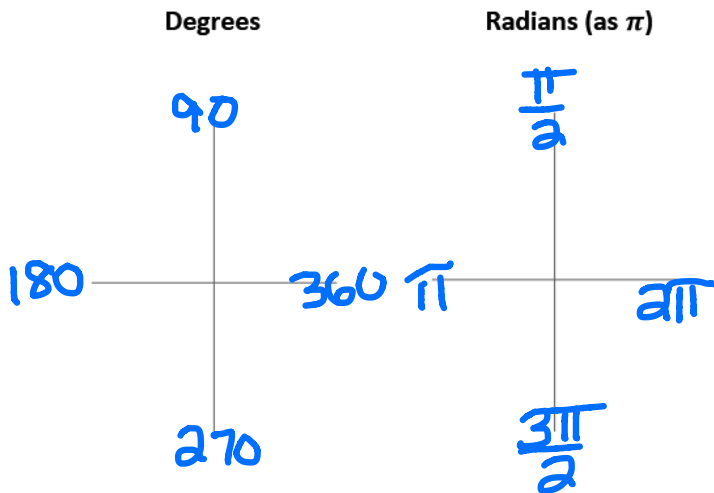
Degrees and Radians Review

Put your calculator in radians, solve for θ

1. $\cos(\theta) + 1 = 0$

$\cos^{-1}(\cos \theta = -1)$
 $\theta = \cos^{-1}(-1)$

$\theta = \pi$
 $\theta = 3.14^R$



What quadrant do the following angles lie?

- 247° $\frac{7\pi}{8}$ 5.5^R 2.25^R 1.4^R 3.87^R $\frac{12\pi}{7}$

- 3 2 4 2 1 3 4

Put your calculator in degrees, solve for θ

$5\cos(\theta) + 2 = 0$

$5\cos \theta = -2$
 $\cos \theta = -\frac{2}{5}$
 $\cos^{-1}(\cos \theta = -\frac{2}{5})$

Put your calculator in radians, solve for θ

$3\tan(\theta) - 8 = 0$

$\tan^{-1}(\frac{8}{3}) = \theta$

Q1 1.21^R ← ref angle
 Q3 4.35^R

Solve Trig Equations
 2 answers

Q2 113.58°
 Q3 246.42°

180 - 113.58 = 66.42 ref angle

180 + 66.42

3.14 + 1.21

* If you know the ratio (Unit circle!) give answers in Radians (with π)

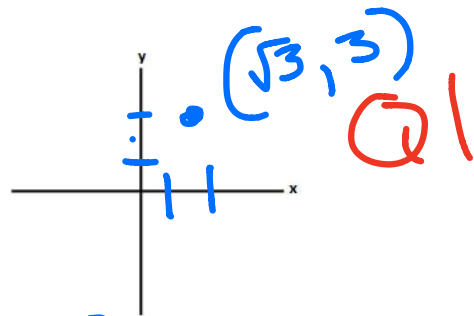
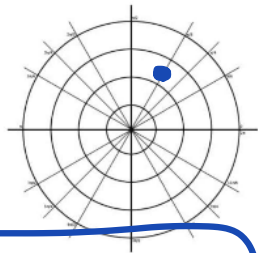
Conversion Formulas:

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

$$r^2 = \frac{x^2 + y^2}{} \quad \text{and} \quad \tan(\theta) = \frac{y}{x}$$

Convert the point $(\sqrt{3}, 3)$ from rectangular to polar
 (use degrees and radians) ← 1.7

1. radius
2. angle



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

$$\left(-2\sqrt{3}, \frac{4\pi}{3} \right)$$

$$(\sqrt{3})^2 + (3)^2 = r^2$$

$$3 + 9 = r^2$$

$$\pm \sqrt{12} = r^2$$

$$\pm 2\sqrt{3} = r$$

$$\tan \theta = \frac{3}{\sqrt{3}}$$

$$\tan \theta = \sqrt{3}$$

$$\theta = \frac{\pi}{3} \text{ Q1}$$

1

Convert the point $(-3, 4)$ from rectangular to polar, then plot both points: (use degrees and radians)

(x, y)

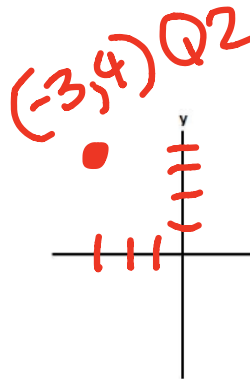
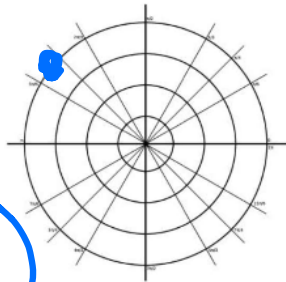
(r, θ)

$(5, 2.21^R)$
and

$(-5, 5.35^R)$

$\frac{6.28}{.93} \text{ OR } 5.35^R$

$\frac{3.14}{.93} = 2.21$



$(-3)^2 + (4)^2 = r^2$
 $\pm 5 = r$

$\tan \theta = \frac{4}{-3}$
 $\theta = -.93^R$
Ref angle

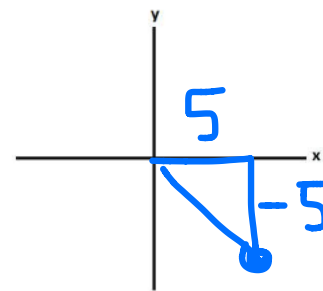
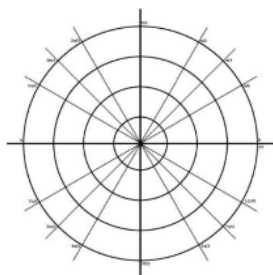
Convert the point $(5, -5)$ from rectangular to polar, then plot the points (use degrees and radians)

Q4

$(5\sqrt{2}, \frac{7\pi}{4})$

and

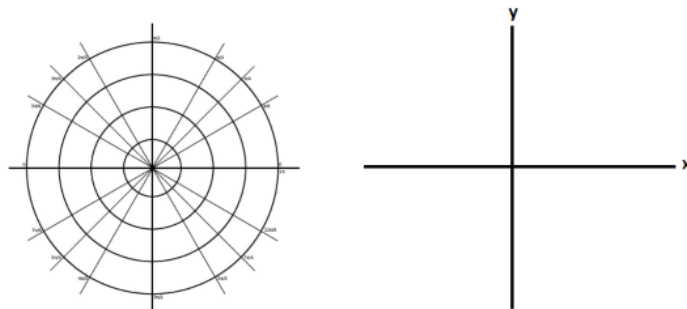
$(-5\sqrt{2}, \frac{3\pi}{4})$



$r = \pm 5\sqrt{2}$
 $\tan^{-1}(-1) = \theta$
Q4

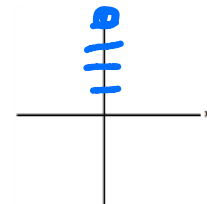
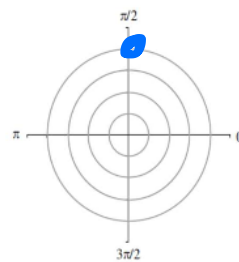
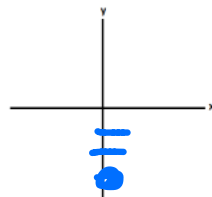
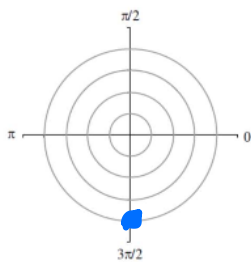
Polar vs Rectangular Coordinates

Convert the point (5, -5) from rectangular to polar, then plot the points (use degrees and radians)



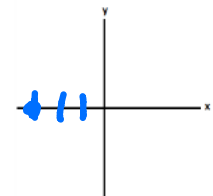
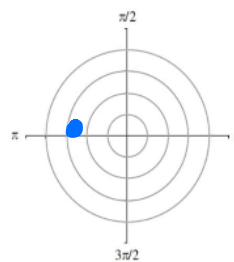
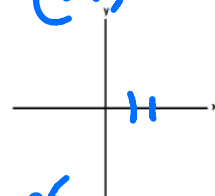
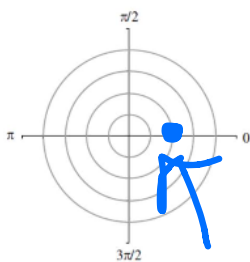
Convert $(0, -3)$ to polar $(3, \frac{3\pi}{2})$

Convert $(0, 4)$ to polar $(4, \frac{\pi}{2})$



Convert $(2, 0)$ to polar $(2, 0)$ OR $(2, 2\pi)$

Convert $(-3, 0)$ to polar $(3, \pi)$



2 names

Polar vs Rectangular Coordinates

Find the polar coordinates (in radians) of each point given the following rectangular coordinates.

1. $(2, 2)$

2. $(2, -3)$

3. $(-3, \sqrt{3})$

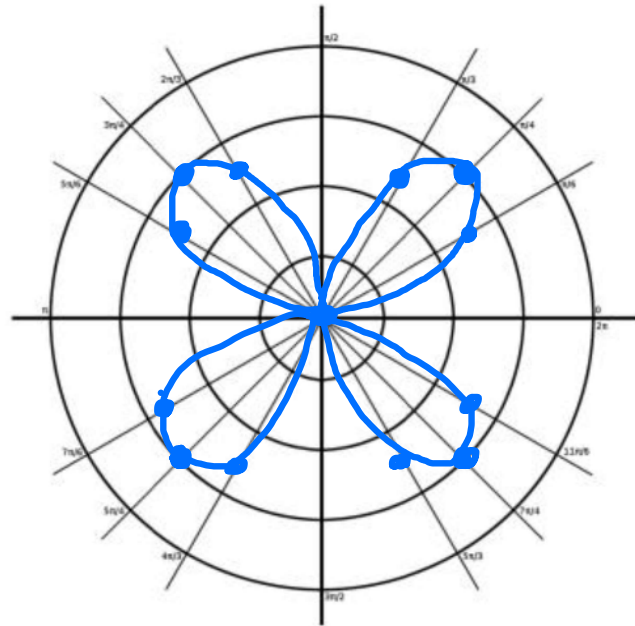
4. $(-5, -8)$

Graph $r = 3\sin(2\theta)$

(Rose Curve)

θ	r
0	0
$\frac{\pi}{6}$	2.6
$\frac{\pi}{3}$	2.6
$\frac{\pi}{2}$	0
$\frac{2\pi}{3}$	-2.6
$\frac{5\pi}{6}$	-2.6
π	0
$\frac{7\pi}{6}$	2.6
$\frac{4\pi}{3}$	2.6
$\frac{3\pi}{2}$	0
$\frac{5\pi}{3}$	-2.6
$\frac{11\pi}{6}$	-2.6
2π	0

$$3\sin\left(2\frac{\pi}{6}\right) = 3\frac{\sqrt{3}}{2}$$



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

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

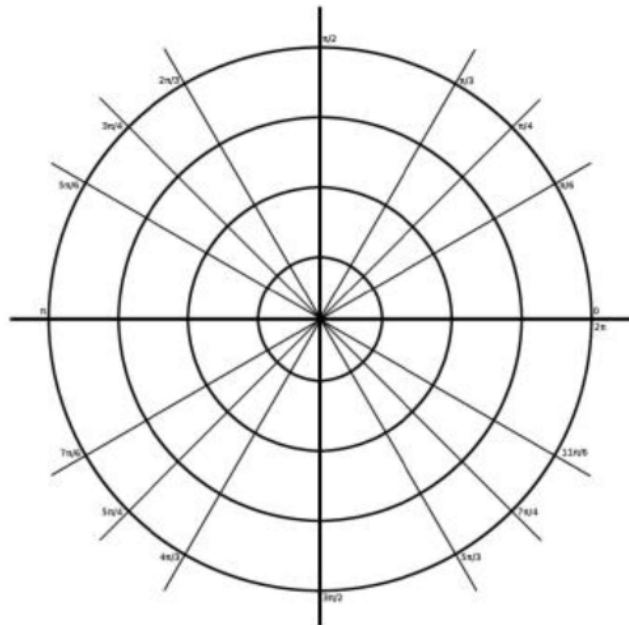
$$\theta = \frac{5\pi}{4} = 3$$

$$\theta = \frac{7\pi}{4} = -3$$

Graph $r = 5 - 3\cos\theta$

(Dimpled Limaçon)

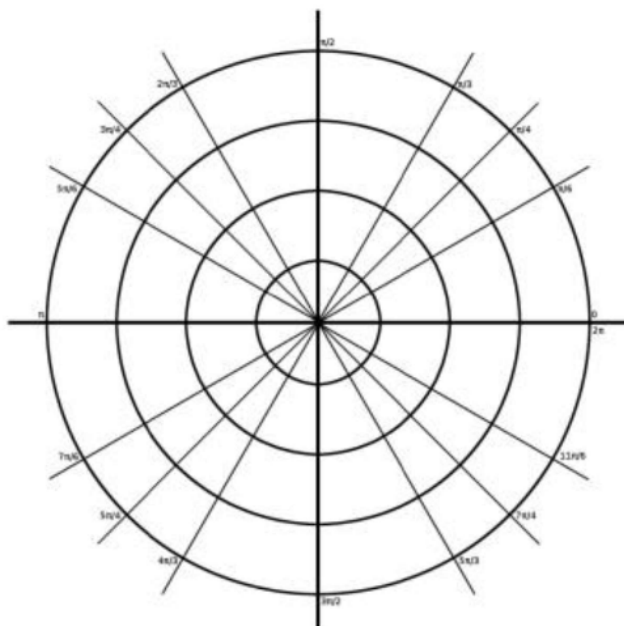
θ	r
0	
$\frac{\pi}{6}$	
$\frac{\pi}{3}$	
$\frac{\pi}{2}$	
$\frac{2\pi}{3}$	
$\frac{5\pi}{6}$	
π	
$\frac{7\pi}{6}$	
$\frac{4\pi}{3}$	
$\frac{3\pi}{2}$	
$\frac{5\pi}{3}$	
$\frac{11\pi}{6}$	
2π	



Graph $r = 3 - 5\cos\theta$

(Limaçon with an inner loop)

θ	r
0	
$\frac{\pi}{6}$	
$\frac{\pi}{3}$	
$\frac{\pi}{2}$	
$\frac{2\pi}{3}$	
$\frac{5\pi}{6}$	
π	
$\frac{7\pi}{6}$	
$\frac{4\pi}{3}$	
$\frac{3\pi}{2}$	
$\frac{5\pi}{3}$	
$\frac{11\pi}{6}$	
2π	



Graph $r = 2 + 2\sin\theta$

(Cardioid)

θ	r
0	
$\frac{\pi}{6}$	
$\frac{\pi}{3}$	
$\frac{\pi}{2}$	
$\frac{2\pi}{3}$	
$\frac{5\pi}{6}$	
π	
$\frac{7\pi}{6}$	
$\frac{4\pi}{3}$	
$\frac{3\pi}{2}$	
$\frac{5\pi}{3}$	
$\frac{11\pi}{6}$	
2π	

