

Pre-Calculus **REVIEW**

6.3-6.5

Name: \_\_\_\_\_

**Key**

2/13/17

x y

1. Convert
- $(1, -2)$
- from rectangular coordinates to polar coordinates.

$$r = \sqrt{1^2 + (-2)^2} = \sqrt{1+4} = \sqrt{5}$$

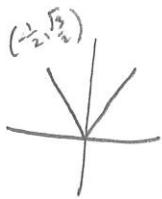
$$\tan^{-1}\left(\frac{-2}{1}\right) = -63.43^\circ = 296.6^\circ$$

$(\sqrt{5}, 296.6^\circ)$

2. Convert
- $\left(6, \frac{2\pi}{3}\right)$
- from polar coordinates to rectangular coordinates. Your answer must be exact for full credit.

$$x = 6 \cos \frac{2\pi}{3}$$

$$y = 6 \sin \frac{2\pi}{3}$$



$$x = 6\left(-\frac{1}{2}\right)$$

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

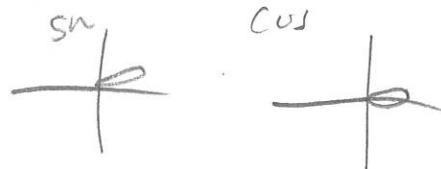
$$x = -3$$

$$y = 3\sqrt{3}$$

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

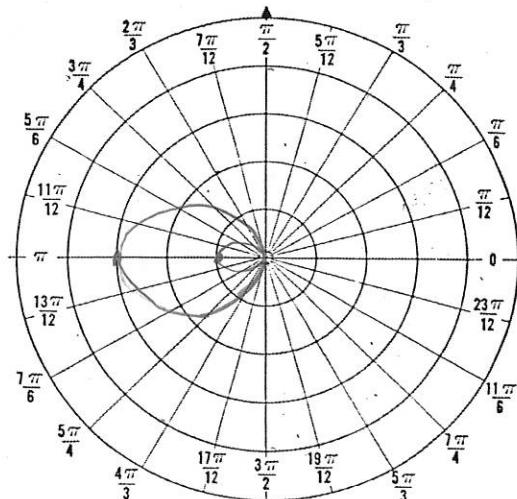
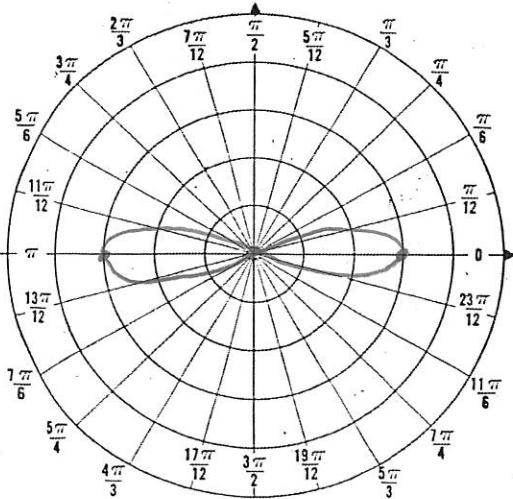
3. The graph of
- $r = 5 \sin 8\theta$
- is a flower shape. What characteristics would the graph have? What type of symmetry would the graph have?

This graph has 16 petals that go out to a radius of 5.  
The first petal is not on the x-axis.  
It is symmetric across the pole.



4. Graph
- $r^2 = 9 \cos 2\theta$

5. Graph
- $r = 1 - 2 \cos \theta$



$$z^n = [r(\cos \theta + i \sin \theta)]^n = r^n(\cos n\theta + i \sin n\theta)$$

6. Convert to rectangular form.

A)  $r=4$

$$r^2 = 16$$

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

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

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

$$\frac{y}{x} = -1$$

c)  $r = 10 \sin \theta$

$$r^2 = 10r \sin \theta$$

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

$$x^2 + y^2 - 10y + 25 = 25$$

$$(x^2 + (y-5)^2 = 25)$$

7. Convert from rectangular to polar form.

A)  $y=5$

$$\frac{r \cos \theta}{\cos \theta} = \frac{5}{\cos \theta}$$

$$r = \frac{5}{\cos \theta}$$

B)  $x+y=8$

$$r \cos \theta + r \sin \theta = 8$$

$$r(\cos \theta + \sin \theta) = 8$$

$$r = \frac{8}{\cos \theta + \sin \theta}$$

C)  $y^2 = 3x$

$$\frac{r \sin^2 \theta}{r} = \frac{3r \cos \theta}{r}$$

$$\frac{r \sin^2 \theta}{\sin^2 \theta} = \frac{3 \cos \theta}{\sin^2 \theta}$$

$$r = \frac{3 \cos \theta}{\sin^2 \theta}$$

8. Convert the complex number  $2+2i$  to a complex number in polar form. Express your final answer in radians.

$$r = \sqrt{2^2 + 2^2} = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2}$$

$$\tan \theta = \frac{2}{2} \quad \tan \theta = 1 \quad \tan^{-1}(1) = \frac{\pi}{4}$$

$$2\sqrt{2} \left( \cos \frac{\pi}{4} + i \sin \frac{\pi}{4} \right)$$

9. Write the complex number  $z = 12(\cos 60^\circ + i \sin 60^\circ)$  in rectangular form (exact answers).

$$12 \left( \frac{1}{2} + i \frac{\sqrt{3}}{2} \right)$$

$$6 + 6i\sqrt{3}$$

$$z_1 = 18 \left( \cos \frac{5\pi}{8} + i \sin \frac{5\pi}{8} \right)$$

10. Find the product when

$$z_1 = 4(\cos 15^\circ + i \sin 15^\circ)$$

$$z_2 = 3(\cos 35^\circ + i \sin 35^\circ)$$

$$4 \cdot 3$$

$$15 + 35$$

$$12(\cos 50^\circ + i \sin 50^\circ)$$

11. Find the quotient when

$$z_1 = 3 \left( \cos \frac{\pi}{4} + i \sin \frac{\pi}{4} \right)$$

$$\frac{15}{3} \quad \frac{5\pi}{8} - \frac{\pi}{4} \quad \frac{5\pi}{8} - \frac{2\pi}{8}$$

$$6 \left( \cos \frac{3\pi}{8} + i \sin \frac{3\pi}{8} \right)$$

12. Find the indicated power:  $z_1 = 2(\cos 10^\circ + i \sin 10^\circ)^3$

$$2^3 \left[ \cos(3 \cdot 10^\circ) + i \sin(3 \cdot 10^\circ) \right]$$

$$8 (\cos 30^\circ + i \sin 30^\circ)$$

 Make SURE  
you know how to  
convert to  
rectangular form  
of a complex #