

HONORS PRECALC

Name: Key

POLAR REVIEW

1. Plot the following:

A. $(6, \frac{7\pi}{6})$

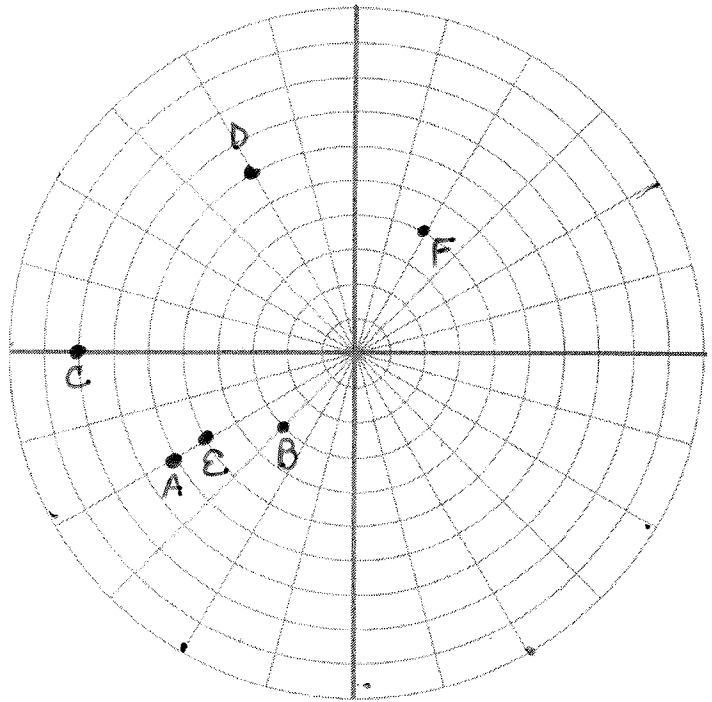
B. $(3, -\frac{3\pi}{4})$

C. $(8, \pi)$

D. $(-6, \frac{5\pi}{3})$

E. $(-5, -\frac{11\pi}{6})$

F. $(-4, -\frac{2\pi}{3})$



Find the rectangular coordinates for each of the following polar coordinates:

2. $(4, \frac{5\pi}{6})$

3. $(8, -\frac{2\pi}{3})$

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

$$x = 4 \cos \frac{5\pi}{6} = 4(-\frac{\sqrt{3}}{2}) = -2\sqrt{3}$$

$$y = 4 \sin \frac{5\pi}{6} = 4(\frac{1}{2}) = 2$$

$$(-2\sqrt{3}, 2)$$

$$x = 8 \cos(-\frac{2\pi}{3}) = 8(-\frac{1}{2}) = -4$$

$$y = 8 \sin(-\frac{2\pi}{3}) = 8(-\frac{\sqrt{3}}{2}) = -4\sqrt{3}$$

$$(-4, -4\sqrt{3})$$

$$x = -4 \cos \frac{5\pi}{3} = -4(\frac{1}{2}) = -2$$

$$y = -4 \sin \frac{5\pi}{3} = -4(-\frac{\sqrt{3}}{2}) = 2\sqrt{3}$$

$$(-2, 2\sqrt{3})$$

Given the rectangular coordinates below, find the polar coordinates satisfying the conditions given:

5. $(3, -3)$; $r \geq 0$ and $0 \leq \theta \leq 2\pi$

$$r = \sqrt{3^2 + (-3)^2} = \sqrt{18} = 3\sqrt{2}$$

$$\hat{\theta} = \tan^{-1}(\frac{-3}{3}) = \tan^{-1}(-1) = 315^\circ = \frac{7\pi}{4}$$

$$(3\sqrt{2}, \frac{7\pi}{4})$$

6. $(-5, -5\sqrt{3})$; $r \leq 0$ and $-\pi \leq \theta \leq \pi$

$$r = \sqrt{(-5)^2 + (-5\sqrt{3})^2} = \sqrt{25 + 75} = 10$$

$$\hat{\theta} = \tan^{-1}(\frac{-5\sqrt{3}}{-5}) = \tan^{-1}(\sqrt{3}) = \frac{\pi}{3}$$

in Q3 $(10, \frac{4\pi}{3})$

*with restrictions name as $(-10, \frac{\pi}{3})$

7. $(4\sqrt{3}, 4)$; $r \leq 0$ and $0 \leq \theta \leq 2\pi$

$$r = \sqrt{(4\sqrt{3})^2 + 4^2} = \sqrt{48 + 16} = \sqrt{64} = 8$$

$$\hat{\theta} = \tan^{-1}(\frac{4}{4\sqrt{3}}) = \tan^{-1}(\frac{1}{\sqrt{3}}) = \frac{\pi}{6}$$

$$(8, \frac{\pi}{6}) \text{ rename as } (-8, \frac{7\pi}{6})$$

8. $(-4, 4)$; $r \leq 0$ and $0 \leq \theta \leq 2\pi$

$$r = \sqrt{(-4)^2 + 4^2} = \sqrt{16 + 16} = \sqrt{32} = 4\sqrt{2}$$

$$\hat{\theta} = \tan^{-1}(\frac{4}{-4}) = \tan^{-1}(-1) = \frac{3\pi}{4}$$

$$(4\sqrt{2}, \frac{3\pi}{4}) \text{ rename as } (-4\sqrt{2}, \frac{7\pi}{4})$$

Change the following polar equations to rectangular equations:

9. $r = 8$

$$\sqrt{x^2+y^2} = 8$$

$$x^2+y^2 = 64$$

10. $r \cos \theta = 6$

$$x = 6$$

11. $r = -5 \csc \theta$

$$r = \frac{-5}{\sin \theta}$$

$$r \sin \theta = -5$$

$$y = -5$$

13. $r = -3 \sec \theta$

$$r = \frac{-3}{\cos \theta}$$

$$r \cos \theta = -3 \quad x = -3$$

12. $r = 7 \sin \theta$

$$\sqrt{x^2+y^2} = \frac{7y}{r}$$

$$\sqrt{x^2+y^2} = \frac{7y}{\sqrt{x^2+y^2}}$$

14. $r = 5 \cos \theta$

14. $r = 5 \cos \theta$

$$\sqrt{x^2+y^2} = \frac{5x}{r}$$

$$\sqrt{x^2+y^2} = \frac{5x}{\sqrt{x^2+y^2}}$$

$$\rightarrow x^2+y^2 = 5x$$

$$x^2-5x+25/4+y^2 = 25/4$$

$$(x-5/2)^2+y^2 = 25/4$$

$$x^2+y^2 = 7y$$

$$x^2+y^2-7y+49/4 = 49/4$$

$$x^2+(y-7/2)^2 = 49/4$$

Change the following rectangular equations to polar equations:

15. $x^2 + y^2 = 81$

$$r^2 = 81$$

$$r = 9 \quad (\text{OR } r = -9)$$

(you don't need both)

17. $y^2 = 10x$

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

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

$$r = \frac{10 \cos \theta}{\sin^2 \theta} = \frac{10 \cos \theta}{\sin \theta \sin \theta} = 10 \cot \theta \csc \theta$$

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

$$r^2 = 10$$

$$r = \sqrt{10} \quad (\text{OR } r = -\sqrt{10})$$

(you don't need both)

16. $y = -5$

$$r \sin \theta = -5$$

$$r = \frac{-5}{\sin \theta}$$

$$r = -5 \csc \theta$$

18. $3xy = 7$

$$3xy = 7$$

$$3 r \cos \theta \cdot r \sin \theta = 7$$

$$3 r^2 \cos \theta \sin \theta = 7$$

$$r^2 = \frac{7}{3 \cos \theta \sin \theta}$$

$$r = \frac{1}{\sqrt{3}} \sec \theta \csc \theta$$

20. $2x - y^2 = 0$

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

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

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

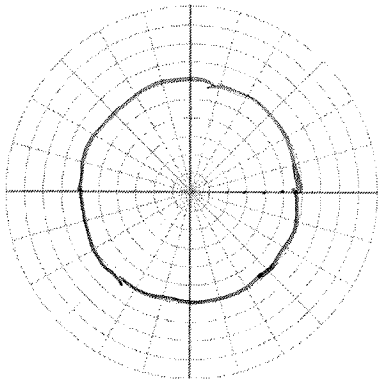
$$\frac{2 \cos \theta}{\sin^2 \theta} = r$$

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

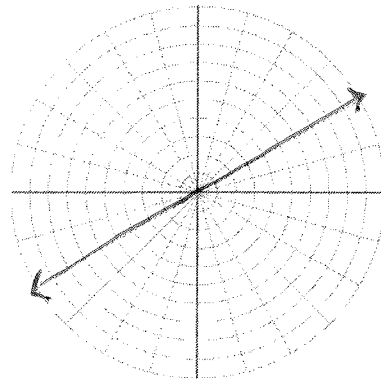
$$2 \cot \theta \csc \theta = r$$

Graph:

13. $r = 6$

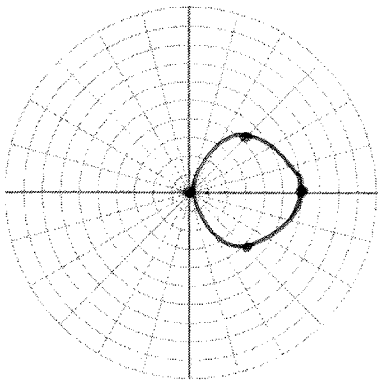


14. $\theta = -\frac{5\pi}{6}$



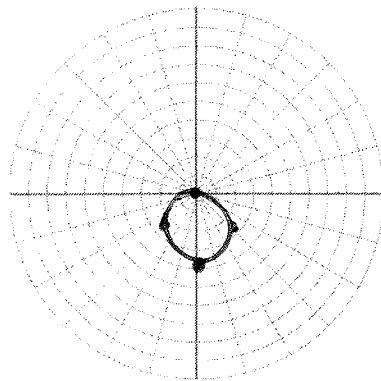
15. $r = 6 \cos \theta$

$r = 6 \frac{\sqrt{2}}{2} \quad \theta = 45^\circ$
 $= 3\sqrt{2} = 4.24$



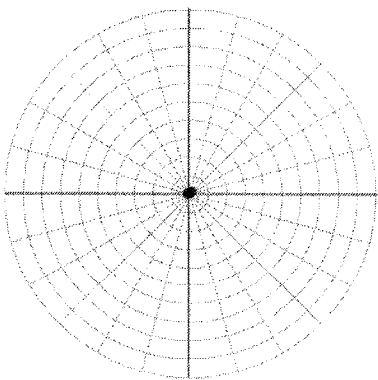
16. $r = -4 \sin \theta$

$-4 \frac{\sqrt{2}}{2} \quad \theta = 45^\circ$
 $= -2\sqrt{2} = -2.8$



17. $r = \frac{3}{2} \theta$

$\frac{r}{\theta} = \frac{3}{2}$



18. $r = \frac{-5}{\theta}$

