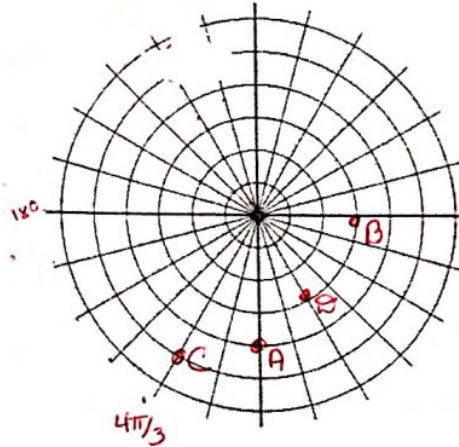


Name: Key

Polar Review

Plot each polar coordinate on the graph.

1. $A(4, 270^\circ)$
2. $B(-3, \pi)$
3. $C(5, \frac{4\pi}{3})$
240
4. $D(-3, 120^\circ)$



Convert each of the following rectangular coordinates to polar coordinates. Answers for θ should be in radians, exact answers if possible. If you need to have decimals, please round to the nearest thousandth.

QII 5. $(-3, 3)$

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

$$r = \sqrt{18} = 3\sqrt{2}$$

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

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

QIII 6. $(-2, -2\sqrt{3})$

$$r = \sqrt{4 + 4(3)} = \sqrt{16} = 4$$

$$\theta = \tan^{-1}\left(\frac{-2\sqrt{3}}{-2}\right) = \tan^{-1}(1)$$

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

7. $(-0.8, -2.1)$ QIII

$$r = \sqrt{(-0.8)^2 + (-2.1)^2} \approx 2.247$$

$$\tan \theta = \frac{-2.1}{-0.8} \approx 1.207, \text{ QIII}$$

$$\theta = 1.207 + \pi = (2.247, 4.348)$$

8. $(-2.3, 0.2)$ QII

$$r = \sqrt{x^2 + y^2} \approx 2.309$$

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

$$\theta = -0.087 + \pi$$

$$(2.309, 3.055)$$

Convert each of the following polar coordinates to rectangular coordinates. Decimals should be rounded to the nearest thousandth.

9. $(5, 300^\circ)$

$$x = r \cos \theta$$

$$= 5 \cos 300$$

$$= 5(1/2)$$

$$y = r \sin \theta$$

$$= 5 \sin 300$$

$$= 5(-\sqrt{3}/2)$$

$$(5/2, 5\sqrt{3}/2)$$

10. $(4, \frac{3\pi}{2})$

$$x = 4 \cos\left(\frac{3\pi}{2}\right)$$

$$= 4(0)$$

$$y = 4 \sin\left(\frac{3\pi}{2}\right)$$

$$= 4(-1)$$

$$(0, -4)$$

11. $(-3.1, 182^\circ)$

$x = 3.1 \cos 182^\circ$ $y = -3.1 \sin 182^\circ$
 $(3.098, 0.108)$

12. $(8.1, 5.2)$

$x = 8.1 \cos 5.2$
 $y = 8.1 \sin 5.2$
 $(3.795, -7.156)$

Find the other 3 polar coordinates that represent the same point for $-2\pi \leq \theta \leq 2\pi$.

13. $(4, \frac{3\pi}{4})$

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

$(-4, \pi/4)$

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

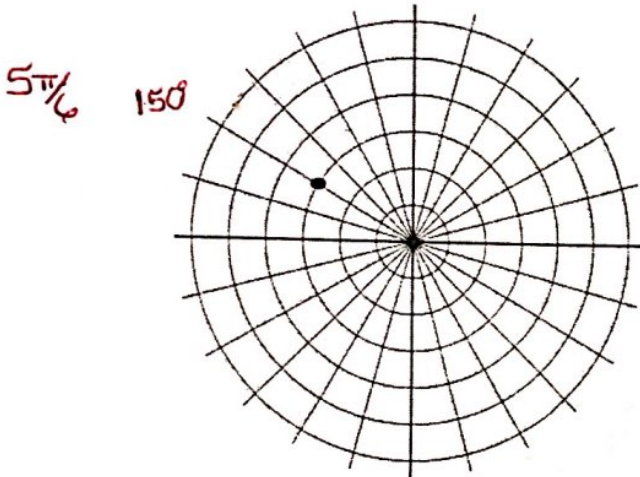
14. $(-2, -\frac{2\pi}{3})$

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

$(2, \pi/3)$

$(2, -5\pi/3)$

15. Find all polar coordinates for the point such that $-2\pi \leq \theta \leq 2\pi$.



$(3, 5\pi/6)$

$(3, -\pi/6)$

$(-3, 11\pi/6)$

$(-3, -\pi/6)$

Find the other 3 polar coordinates that represent the same point for $-360^\circ \leq \theta \leq 360^\circ$.

16. $(3, -20^\circ)$

$(3, 340^\circ)$

$(-3, 160^\circ)$

$(-3, -200^\circ)$

17. $(-4, 103^\circ)$

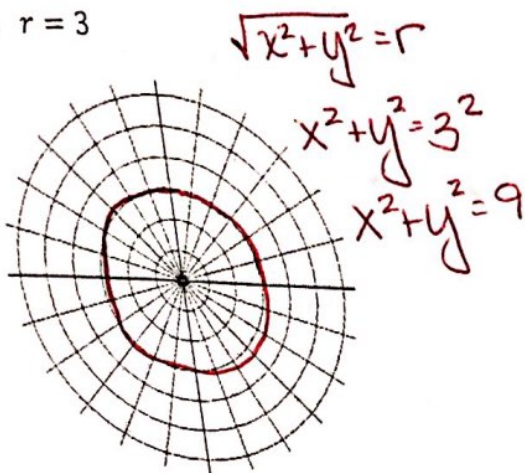
$(-4, -257^\circ)$

$(4, 283^\circ)$

$(4, -77^\circ)$

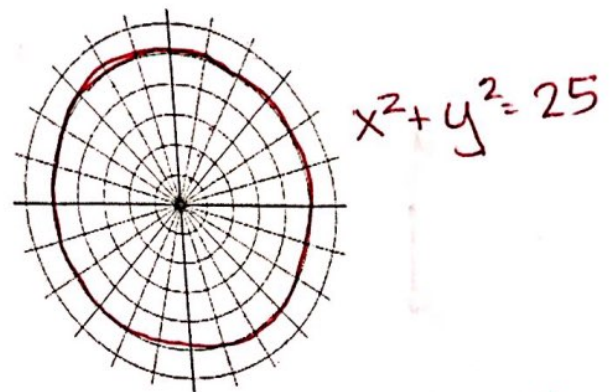
Graph each polar equation. Then convert the equation to rectangular form.

18. $r = 3$



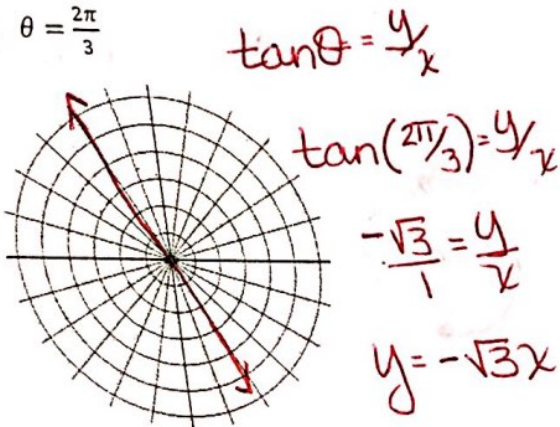
rectangular equation: $x^2 + y^2 = 9$

19. $r = 5$



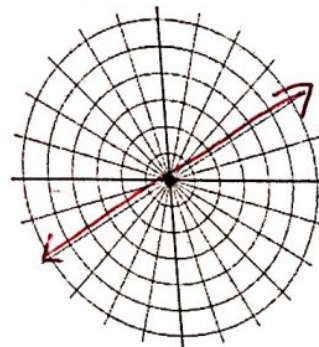
rectangular equation: $x^2 + y^2 = 25$

18. $\theta = \frac{2\pi}{3}$



rectangular equation: $y = -\sqrt{3}x$

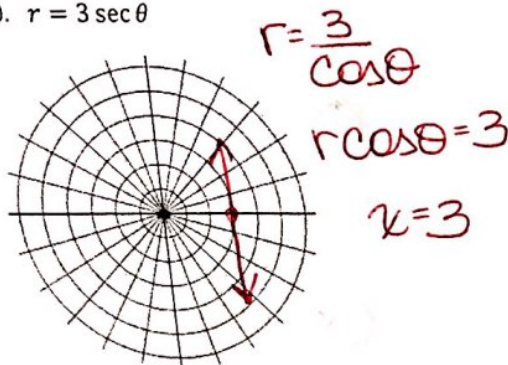
19. $\theta = 30^\circ$



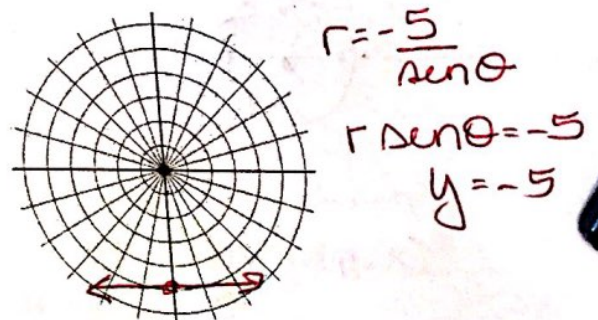
rectangular equation: $y = \frac{\sqrt{3}}{3}x$

Convert the following polar equations into rectangular equations so that you can graph them.

20. $r = 3 \sec \theta$



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

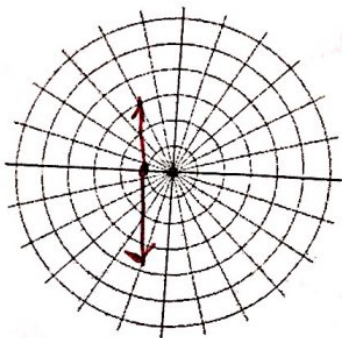


22. $r = -\frac{1}{\cos \theta}$

$x = -1$

$r \cos \theta = -1$

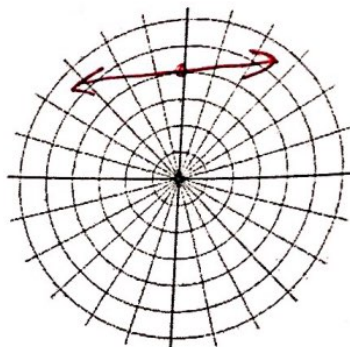
$x = -1$



23. $r = \frac{4}{\sin \theta}$

$r \sin \theta = 4$

$y = 4$



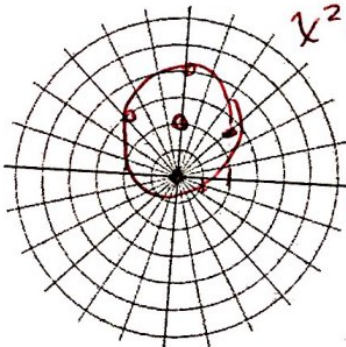
24. $(r = 4 \sin \theta)$

$r^2 = 4r \sin \theta$

$x^2 + y^2 = 4y$

$x^2 + y^2 - 4y + 4 = 0 + 4$

$(x)^2 + (y+2)^2 = 4$



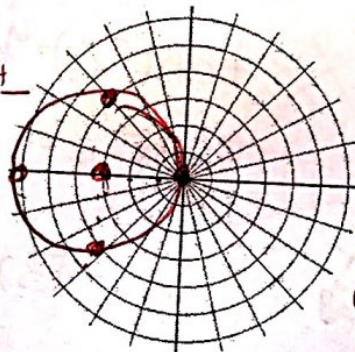
25. $r = -6 \cos \theta$

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

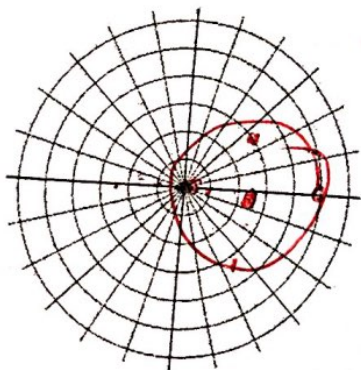
$x^2 + y^2 = -6x$

$x^2 + 6x + 9 + y^2 = 0 + 9$

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

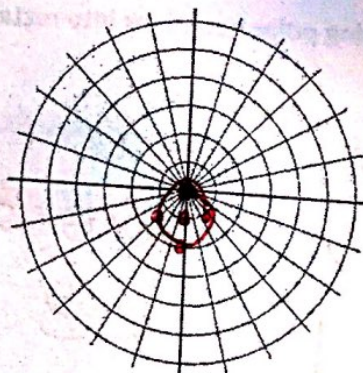


25. $r = 5 \cos \theta$



$(x-2.5)^2 + y^2 = 6.25$

26. $r = -2 \sin \theta$



$(x)^2 + (y+1)^2 = 1$

Convert each of the following polar equations to rectangular form (general conic form). Classify the conic.

27. $r = 2 \sin \theta - 6 \cos \theta$

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

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

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

Circle

29. $r = \frac{3}{5-2 \sin \theta}$ Ellipse

$$5r - 2r \sin \theta = 3$$

$$5\sqrt{x^2 + y^2} - 2y = 3$$

$$\sqrt{x^2 + y^2} = \frac{3+2y}{5}$$

$$x^2 + y^2 = \frac{4y^2 + 12y + 9}{25}$$

$$25x^2 + 25y^2 = 4y^2 + 12y + 9$$

$$25x^2 + 21y^2 - 12y - 9 = 0$$

Convert each of the following rectangular equations to polar form.

31. $x^2 + y^2 = 4x$

$$r^2 = 4r \cos \theta$$

$$r^2 - 4r \cos \theta = 0$$

$$r(r - 4 \cos \theta) = 0$$

$$r = 4 \cos \theta$$

33. $y = -x$

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

$$\theta = 3\pi/4$$

$$\alpha 7\pi/4, 135^\circ, 315^\circ$$

28. $r = \frac{1}{1 + \cos \theta}$

$$r + r \cos \theta = 1$$

$$\sqrt{x^2 + y^2} + x = 1 \Rightarrow \sqrt{x^2 + y^2} = (1-x)$$

$$x^2 + y^2 = (1-x)^2$$

$$x^2 + y^2 = x^2 - 2x + 1$$

$$y^2 = -2x + 1 \text{ parabola}$$

30. $r = \frac{2}{1+4 \cos \theta}$ hyperbola

$$-15x^2 + y + 16x - 4 = 0$$

32. $(x-7)^2 + (y+2)^2 = 53$

$$x^2 - 14x + 49 + y^2 + 4y + 4 = 53$$

$$x^2 + y^2 - 14x + 4y = 0$$

$$r^2 - 14r \cos \theta + 4r \sin \theta = 0$$

$$r(r - 14 \cos \theta + 4 \sin \theta) = 0$$

34. $y = \frac{\sqrt{3}}{3}x$

$$\tan^{-1}\left(\frac{y}{x}\right) = \frac{\sqrt{3}}{3}$$

$$\theta = \pi/6$$

$$\alpha 7\pi/6, 30^\circ, 210^\circ$$

$$r = 14 \cos \theta - 4 \sin \theta$$

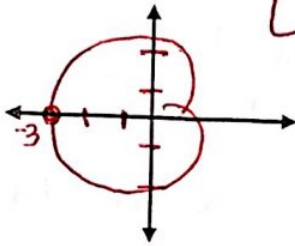
Identify and sketch a graph for the following.

35. $r = 2 - \cos \theta$

Amp < V.S

identification:

Limacon

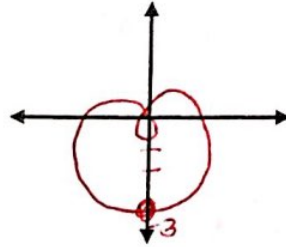


36. $r = 1 - 2 \sin \theta$

Amp > V.S

identification:

Limacon w/
loop

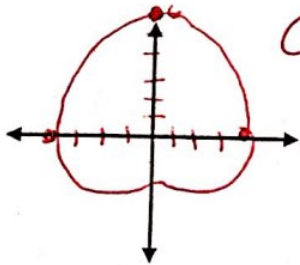


37. $r = 4 + 2 \sin \theta$

identification:

Amp < V.S

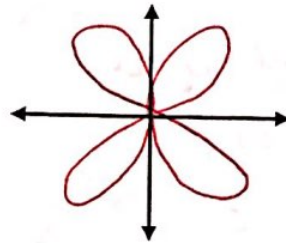
Limacon



38. $r = 2 \sin 2\theta$

identification:

rose
4 petals

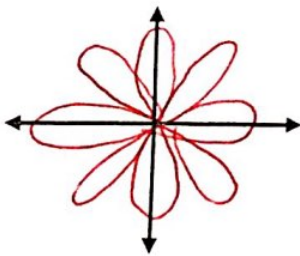


39. $r = 3 \cos 4\theta$

identification:

rose

8 petals



40. $r = 6 \sin 3\theta$

identification:

rose 3 petals

