Polar Coordinates

SUGGESTED REFERENCE MATERIAL:

As you work through the problems listed below, you should reference Chapter 10.2 of the recommended textbook (or the equivalent chapter in your alternative textbook/online resource) and your lecture notes.

EXPECTED SKILLS:

- Be able to describe points and curves in both polar and rectangular form, and be able to convert between the two coordinate systems.
- Know the formulas for the basic shapes in polar coordinates: circles, lines, limacons, cardioids, rose curves, and spirals.

PRACTICE PROBLEMS:

For problems 1-6, compute the rectangular coordinates of the points whose polar coordinates are given.

1. $\left(-1, \frac{\pi}{3}\right)$
2. $\left(3, \frac{2\pi}{3}\right)$
3. $(5, -\pi)$
4. $\left(-2, \frac{9\pi}{4}\right)$
5. $\left(6, \frac{11\pi}{6}\right)$

For problems 7-11, find two pairs of polar coordinates for the point whose rectangular coordinates are given. The first pair should satisfy $r \geq 0$ and $0 \leq \theta < 2\pi$. The second pair should satisfy $r \geq 0$ and $-2\pi < \theta \leq 0$.

7. $(-5, -5)$
8. $(-3, 3)$
9. $(0, 3)$
10. $\left(\sqrt{3}, -1\right)$

11. $\left(-4\sqrt{3}, -4\right)$

12. Consider the point with rectangular coordinates $\left(1, \sqrt{3}\right)$.

    (a) Find a pair of polar coordinates which satisfy $r \geq 0$ and $0 \leq \theta < 2\pi$

    (b) Find a pair of polar coordinates which satisfy $r \leq 0$ and $0 \leq \theta < 2\pi$

    (c) Find a pair of polar coordinates which satisfy $r \geq 0$ and $-2\pi < \theta \leq 0$

    (d) Find a pair of polar coordinates which satisfy $r \leq 0$ and $-2\pi < \theta \leq 0$

For problems 13-17, identify the curve by transforming the polar equation into rectangular coordinates.

13. $r = 1$

14. $r = 2\cos\theta$

15. $r\sin\theta = 2$

16. $r = 3\cos\theta - 2\sin\theta$

17. $r = 6\sec\theta$

For problems 18-21, express the given equation in polar coordinates.

18. $y = 2$

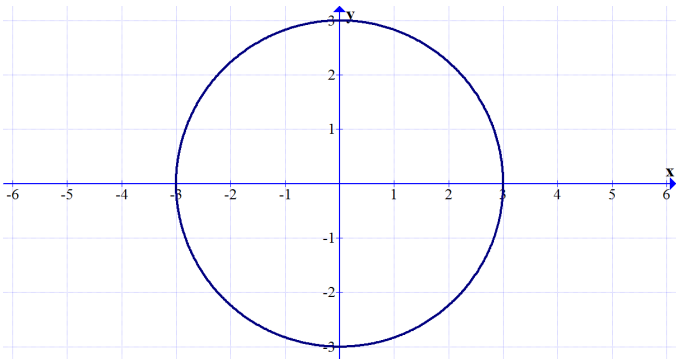
19. $x = 3$

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

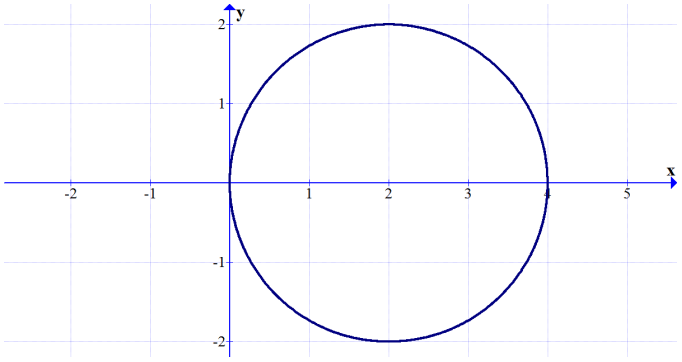
21. $x^2 + y^2 + 8y = 0$

For problems 22-24, find an equation in polar coordinates for each of the given graphs.

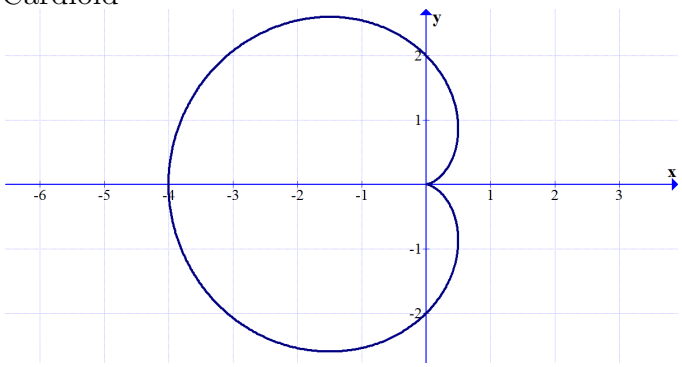
22. Circle:



23. Circle



24. Cardioid



For problems 25-34, sketch the curve in polar coordinates.

25. $r = 2$
26. $r = \cos\theta$
27. $r = 3\sin\theta$
28. $r = 3 + 3\sin\theta$
29. $r = 1 - 2\cos\theta$
30. $r = 3\theta,\ 0 \leq \theta \leq 2\pi$
31. $r = 2 - 3\sin\theta$
32. $r = 2(1 + \cos\theta)$
33. $r = 4\cos 2\theta$
34. $r = -3\sin 3\theta$