# 10.4 Q's

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# 10.4 Exercises

See CalcChat.com for tutorial help and worked-out solutions to odd-numbered exercises.

**Polar-to-Rectangular Conversion** **In Exercises 1–10, plot the point in polar coordinates and find the corresponding rectangular coordinates for the point.**

1. $\left(8, \frac{\pi}{2}\right)$
2. $\left(-2, \frac{5\pi}{3}\right)$
3. $\left(-4, -\frac{3\pi}{4}\right)$
4. $\left(0, -\frac{7\pi}{6}\right)$
5. $\left(7, \frac{5\pi}{4}\right)$
6. $\left(-2, \frac{11\pi}{6}\right)$
7. $(\sqrt{2}, 2.36)$
8. $(-3, -1.57)$
9. $(-4.5, 3.5)$
10. $(9.25, 1.2)$

**Rectangular-to-Polar Conversion** **In Exercises 11–20, the rectangular coordinates of a point are given. Plot the point and find *two* sets of polar coordinates for the point for $0 \le \theta < 2\pi$.**

11. $(2, 2)$
12. $(0, -6)$
13. $(-3, 4)$
14. $(4, -2)$
15. $(-1, -\sqrt{3})$
16. $(3, -\sqrt{3})$
17. $(3, -2)$
18. $(3\sqrt{2}, 3\sqrt{2})$
19. $\left(\frac{7}{4}, \frac{5}{2}\right)$
20. $(0, -5)$

21. **Plotting a Point** Plot the point $(4, 3.5)$ when the point is given in
    (a) rectangular coordinates.
    (b) polar coordinates.

22. **Graphical Reasoning**
    (a) Set the window format of a graphing utility to rectangular coordinates and locate the cursor at any position off the axes. Move the cursor horizontally and vertically. Describe any changes in the displayed coordinates of the points.
    (b) Set the window format of a graphing utility to polar coordinates and locate the cursor at any position off the axes. Move the cursor horizontally and vertically. Describe any changes in the displayed coordinates of the points.
    (c) Why are the results in parts (a) and (b) different?

**Rectangular-to-Polar Conversion** **In Exercises 23–32, convert the rectangular equation to polar form and sketch its graph.**

23. $x^2 + y^2 = 9$
24. $x^2 - y^2 = 9$
25. $x^2 + y^2 = a^2$
26. $x^2 + y^2 - 2ax = 0$
27. $y = 8$
28. $x = 12$
29. $3x - y + 2 = 0$
30. $xy = 4$
31. $y^2 = 9x$
32. $(x^2 + y^2)^2 - 9(x^2 - y^2) = 0$

**Polar-to-Rectangular Conversion** **In Exercises 33–42, convert the polar equation to rectangular form and sketch its graph.**

33. $r = 4$
34. $r = -5$
35. $r = 3 \sin \theta$
36. $r = 5 \cos \theta$
37. $r = \theta$
38. $\theta = \frac{5\pi}{6}$
39. $r = 3 \sec \theta$
40. $r = 2 \csc \theta$
41. $r = \sec \theta \tan \theta$
42. $r = \cot \theta \csc \theta$

**Graphing a Polar Equation** **In Exercises 43–52, use a graphing utility to graph the polar equation. Find an interval for $\theta$ over which the graph is traced *only once*.**

43. $r = 2 - 5 \cos \theta$
44. $r = 3(1 - 4 \cos \theta)$
45. $r = 2 + \sin \theta$
46. $r = 4 + 3 \cos \theta$
47. $r = \frac{2}{1 + \cos \theta}$
48. $r = \frac{2}{4 - 3 \sin \theta}$
49. $r = 2 \cos\left(\frac{3\theta}{2}\right)$
50. $r = 3 \sin\left(\frac{5\theta}{2}\right)$
51. $r^2 = 4 \sin 2\theta$
52. $r^2 = \frac{1}{\theta}$

53. **Verifying a Polar Equation** Convert the equation
    $r = 2(h \cos \theta + k \sin \theta)$
    to rectangular form and verify that it is the equation of a circle. Find the radius and the rectangular coordinates of the center of the circle.

54. **Distance Formula**
    (a) Verify that the Distance Formula for the distance between the two points $(r_1, \theta_1)$ and $(r_2, \theta_2)$ in polar coordinates is
    $$d = \sqrt{r_1^2 + r_2^2 - 2r_1 r_2 \cos(\theta_1 - \theta_2)}.$$
    (b) Describe the positions of the points relative to each other for $\theta_1 = \theta_2$. Simplify the Distance Formula for this case. Is the simplification what you expected? Explain.
    (c) Simplify the Distance Formula for $\theta_1 - \theta_2 = 90°$. Is the simplification what you expected? Explain.
    (d) Choose two points on the polar coordinate system and find the distance between them. Then choose different polar representations of the same two points and apply the Distance Formula again. Discuss the result.

**Distance Formula** **In Exercises 55–58, use the result of Exercise 54 to approximate the distance between the two points in polar coordinates.**

55. $\left(1, \frac{5\pi}{6}\right), \left(4, \frac{\pi}{3}\right)$
56. $\left(8, \frac{7\pi}{4}\right), (5, \pi)$
57. $(2, 0.5), (7, 1.2)$
58. $(4, 2.5), (12, 1)$