Assume that angles are in radians unless stated otherwise.

In problems 1-9, you are given a point in rectangular coordinates. Convert it to polar coordinates. Your answers should be exact. Express your answer with \( r \geq 0 \) and \( \theta \) in the range \([0, 2\pi)\): an angle if possible, an expression using an arc function of a positive number if necessary.

1. \((3, 3)\)
2. \((0, 5)\)
3. \((-4, 0)\)
4. \((2, 2\sqrt{3})\)
5. \((-5\sqrt{3}, 5)\)
6. \((3, 4)\)
7. \((5, -12)\)
8. \((4, 7)\)
9. \((-3, -5)\)

In problems 10-19, you are given a point in rectangular coordinates. Convert it to polar coordinates with \( \theta \) in degrees. Your answers should be exact. Express your answer with \( r \geq 0 \) and \( \theta \) in the range \([0, 360^\circ)\): an angle if possible, an expression using an arc function of a positive number if necessary.

10. \((8, 0)\)
11. \((10, -10)\)
12. \((6, -2\sqrt{3})\)
13. \((0, -12)\)
14. \((8, 15)\)
15. \((9 \cos 37^\circ, 9 \sin 37^\circ)\)
16. \((-1, 3)\)
17. \((-14 \cos 55^\circ, 14 \sin 55^\circ)\)
18. \((10 \sin 50^\circ, 10 \cos 50^\circ)\)

19. \((7 \sin 22^\circ, -7 \cos 22^\circ)\)

In problems 20-27, you are given a point in polar coordinates. Convert it to rectangular coordinates. Your answers should be exact: numbers if possible, expressions involving trigonometric functions of a reference angle if necessary.

20. \((10, \pi/3)\)

21. \((8, 11\pi/6)\)

22. \((7, -\pi/4)\)

23. \((12, 3\pi/2)\)

24. \((7, 0)\)

25. \((6, \pi/5)\)

26. \((5, 5\pi/8)\)

27. \((10, 22\pi/14)\)

In 28-45, use a calculator to convert the point from one coordinate system to the other. Round your x-, y-, and r-coordinates to four decimal places; your \(\theta\) coordinates to the nearest 0.0001 rad or 0.01\(^\circ\). Express your answer with \(r \geq 0\) and \(\theta\) in the range \([0, 2\pi)\) if in radians; in the range \([0, 360^\circ)\) if in degrees.

28. Convert \((5, 7)\) to polar coordinates with \(\theta\) in radians.

29. Convert \((1.412, 9.550)\) to polar coordinates with \(\theta\) in radians.

30. Convert \((-3.07, 1.24)\) to polar coordinates with \(\theta\) in radians.

31. Convert \((8.331, -4.009)\) to polar coordinates with \(\theta\) in radians.

32. Convert \((-60.72, 0)\) to polar coordinates with \(\theta\) in radians.

33. Convert \((7, 9)\) to polar coordinates with \(\theta\) in degrees.

34. Convert \((-5, 12)\) to polar coordinates with \(\theta\) in degrees.

35. Convert \((-6.65, -4.08)\) to polar coordinates with \(\theta\) in degrees.

36. Convert \((0, -1.1)\) to polar coordinates with \(\theta\) in degrees.
37. Convert \((11, 2\pi/3)\) to rectangular coordinates.
38. Convert \((9, 10\pi/7)\) to rectangular coordinates.
39. Convert \((6, 0.48)\) to rectangular coordinates.
40. Convert \((10, -1.1)\) to rectangular coordinates.
41. Convert \((8, 3.9)\) to rectangular coordinates.
42. Convert \((7, 50^\circ)\) to rectangular coordinates.
43. Convert \((9, -37^\circ)\) to rectangular coordinates.
44. Convert \((15, 229^\circ)\) to rectangular coordinates.
45. Convert \((6, 281^\circ)\) to rectangular coordinates.

In problems 46-55, convert the equations from polar to rectangular form or vice versa.

46. Convert: \(x = 3\) to polar form.
47. Convert: \(y = 3x\) to polar form.
48. Convert: \(x^2 - y = 1\) to polar form.
49. Convert: \(x^2 + y^2 = 25\) to polar form.
50. Convert: \(y^2 - 3x^2 = 1\) to polar form.
51. Convert: \(r = 7\) to rectangular form.
52. Convert: \(\theta = \frac{5\pi}{6}\) to rectangular form.
53. Convert: \(r \sin \theta = 9\) to rectangular form.
54. Convert: \(r(2\cos \theta - 3\sin \theta) = 1\) to rectangular form.
55. Convert: \(r^2(\cos^2 \theta + 3\sin^2 \theta) = 11\) to rectangular form.
56. Which equation corresponds to the graph at right?
(a) \( r = \theta \)
(b) \( r^2 = \theta \)
(c) \( r \sin \theta = 1 \)
(d) \( r = 1 \)
(e) \( \theta = 1 \)

57. Which equation corresponds to the graph at right?
(a) \( r = 2 \)
(b) \( r = 0 \)
(c) \( r \cos \theta = -1 \)
(d) \( \theta = -1 \)
(e) \( \theta = \frac{3\pi}{4} \)

58. Which equation corresponds to the graph at right?
(a) \( r = 3\theta \)
(b) \( r + \theta = 6 \)
(c) \( r = \cos 3\theta \)
(d) \( \theta = \frac{1}{3} \)
(e) \( \theta = \frac{r}{3} \)
59. Which equation corresponds to the graph at right?
(a) \( r = 2\theta \)
(b) \( r = 2\cos\theta \)
(c) \( r = \frac{2}{\theta} \)
(d) \( r = \frac{2}{\cos\theta} \)
(e) \( r^2 = 2\theta \)

60. Which equation corresponds to the graph at right?
(a) \( r = \theta \)
(b) \( r = \sin\theta \)
(c) \( r = \frac{1}{\sin\theta} \)
(d) \( r = \cos\theta - 1 \)
(e) \( r = \frac{1}{\cos^2\theta} \)

61. Which equation corresponds to the graph at right?
(a) \( r = \sin^2\theta \)
(b) \( r = \frac{1}{\cos^2\theta} \)
(c) \( r = \tan\theta \)
(d) \( r = \theta^2 \)
(e) \( r^2 = \cos\theta \)