

Worksheet 21 - Polar Coordinates (§10.6)

In Exercises 1 - 16, plot the point given in polar coordinates and then give three different expressions for the point such that (a) $r < 0$ and $0 \leq \theta \leq 2\pi$, (b) $r > 0$ and $\theta \leq 0$ (c) $r > 0$ and $\theta \geq 2\pi$

- | | | | |
|---|---|---|---|
| 1. $\left(2, \frac{\pi}{3}\right)$ | 2. $\left(5, \frac{7\pi}{4}\right)$ | 3. $\left(\frac{1}{3}, \frac{3\pi}{2}\right)$ | 4. $\left(\frac{5}{2}, \frac{5\pi}{6}\right)$ |
| 5. $\left(12, -\frac{7\pi}{6}\right)$ | 6. $\left(3, -\frac{5\pi}{4}\right)$ | 7. $(2\sqrt{2}, -\pi)$ | 8. $\left(\frac{7}{2}, -\frac{13\pi}{6}\right)$ |
| 9. $(-20, 3\pi)$ | 10. $\left(-4, \frac{5\pi}{4}\right)$ | 11. $\left(-1, \frac{2\pi}{3}\right)$ | 12. $\left(-3, \frac{\pi}{2}\right)$ |
| 13. $\left(-3, -\frac{11\pi}{6}\right)$ | 14. $\left(-2.5, -\frac{\pi}{4}\right)$ | 15. $\left(-\sqrt{5}, -\frac{4\pi}{3}\right)$ | 16. $(-\pi, -\pi)$ |

In Exercises 17 - 36, convert the point from polar coordinates into rectangular coordinates.

- | | | | |
|--|---------------------------------------|--|--|
| 17. $\left(5, \frac{7\pi}{4}\right)$ | 18. $\left(2, \frac{\pi}{3}\right)$ | 19. $\left(11, -\frac{7\pi}{6}\right)$ | 20. $(-20, 3\pi)$ |
| 21. $\left(\frac{3}{5}, \frac{\pi}{2}\right)$ | 22. $\left(-4, \frac{5\pi}{6}\right)$ | 23. $\left(9, \frac{7\pi}{2}\right)$ | 24. $\left(-5, -\frac{9\pi}{4}\right)$ |
| 25. $\left(42, \frac{13\pi}{6}\right)$ | 26. $(-117, 117\pi)$ | 27. $(6, \arctan(2))$ | 28. $(10, \arctan(3))$ |
| 29. $\left(-3, \arctan\left(\frac{4}{3}\right)\right)$ | | 30. $\left(5, \arctan\left(-\frac{4}{3}\right)\right)$ | |
| 31. $\left(2, \pi - \arctan\left(\frac{1}{2}\right)\right)$ | | 32. $\left(-\frac{1}{2}, \pi - \arctan(5)\right)$ | |
| 33. $\left(-1, \pi + \arctan\left(\frac{3}{4}\right)\right)$ | | 34. $\left(\frac{2}{3}, \pi + \arctan(2\sqrt{2})\right)$ | |
| 35. $(\pi, \arctan(\pi))$ | | 36. $\left(13, \arctan\left(\frac{12}{5}\right)\right)$ | |

In Exercises 37 - 56, convert the point from rectangular coordinates into polar coordinates with $r \geq 0$ and $0 \leq \theta < 2\pi$.

- | | | | |
|---------------|-----------------------------|------------------------|---|
| 37. $(0, 5)$ | 38. $(3, \sqrt{3})$ | 39. $(7, -7)$ | 40. $(-3, -\sqrt{3})$ |
| 41. $(-3, 0)$ | 42. $(-\sqrt{2}, \sqrt{2})$ | 43. $(-4, -4\sqrt{3})$ | 44. $\left(\frac{\sqrt{3}}{4}, -\frac{1}{4}\right)$ |

- | | | | |
|---|---------------------------------|---|--|
| 45. $\left(-\frac{3}{10}, -\frac{3\sqrt{3}}{10}\right)$ | 46. $(-\sqrt{5}, -\sqrt{5})$ | 47. $(6, 8)$ | 48. $(\sqrt{5}, 2\sqrt{5})$ |
| 49. $(-8, 1)$ | 50. $(-2\sqrt{10}, 6\sqrt{10})$ | 51. $(-5, -12)$ | 52. $\left(-\frac{\sqrt{5}}{15}, -\frac{2\sqrt{5}}{15}\right)$ |
| 53. $(24, -7)$ | 54. $(12, -9)$ | 55. $\left(\frac{\sqrt{2}}{4}, \frac{\sqrt{6}}{4}\right)$ | 56. $\left(-\frac{\sqrt{65}}{5}, \frac{2\sqrt{65}}{5}\right)$ |

In Exercises 57 - 76, convert the equation from rectangular coordinates into polar coordinates. Solve for r in all but #60 through #63. In Exercises 60 - 63, you need to solve for θ

- | | | | |
|---------------------------|--------------------------|--|----------------------|
| 57. $x = 6$ | 58. $x = -3$ | 59. $y = 7$ | 60. $y = 0$ |
| 61. $y = -x$ | 62. $y = x\sqrt{3}$ | 63. $y = 2x$ | 64. $x^2 + y^2 = 25$ |
| 65. $x^2 + y^2 = 117$ | 66. $y = 4x - 19$ | 67. $x = 3y + 1$ | 68. $y = -3x^2$ |
| 69. $4x = y^2$ | 70. $x^2 + y^2 - 2y = 0$ | 71. $x^2 - 4x + y^2 = 0$ | 72. $x^2 + y^2 = x$ |
| 73. $y^2 = 7y - x^2$ | | 74. $(x + 2)^2 + y^2 = 4$ | |
| 75. $x^2 + (y - 3)^2 = 9$ | | 76. $4x^2 + 4\left(y - \frac{1}{2}\right)^2 = 1$ | |

In Exercises 77 - 96, convert the equation from polar coordinates into rectangular coordinates.

- | | | | |
|-------------------------------------|---------------------------|---------------------------------|-------------------------------------|
| 77. $r = 7$ | 78. $r = -3$ | 79. $r = \sqrt{2}$ | 80. $\theta = \frac{\pi}{4}$ |
| 81. $\theta = \frac{2\pi}{3}$ | 82. $\theta = \pi$ | 83. $\theta = \frac{3\pi}{2}$ | 84. $r = 4\cos(\theta)$ |
| 85. $5r = \cos(\theta)$ | 86. $r = 3\sin(\theta)$ | 87. $r = -2\sin(\theta)$ | 88. $r = 7\sec(\theta)$ |
| 89. $12r = \csc(\theta)$ | 90. $r = -2\sec(\theta)$ | 91. $r = -\sqrt{5}\csc(\theta)$ | 92. $r = 2\sec(\theta)\tan(\theta)$ |
| 93. $r = -\csc(\theta)\cot(\theta)$ | 94. $r^2 = \sin(2\theta)$ | 95. $r = 1 - 2\cos(\theta)$ | 96. $r = 1 + \sin(\theta)$ |