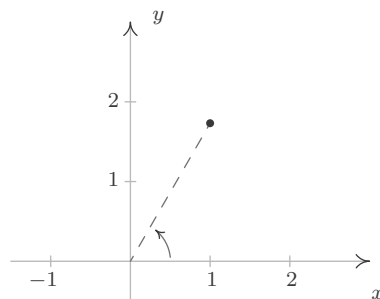


Worksheet 21 KEY - Polar Coordinates (10.6)

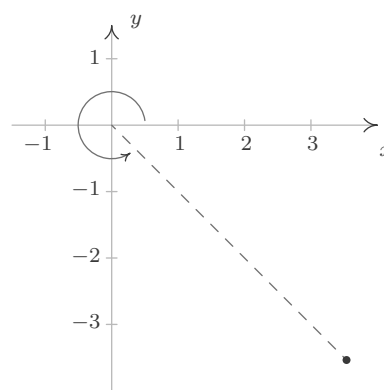
$$1. \left(2, \frac{\pi}{3}\right), \left(-2, \frac{4\pi}{3}\right)$$

$$\left(2, -\frac{5\pi}{3}\right), \left(2, \frac{7\pi}{3}\right)$$



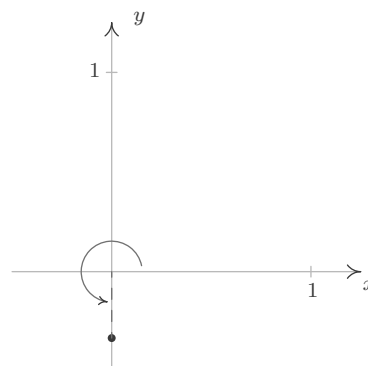
$$2. \left(5, \frac{7\pi}{4}\right), \left(-5, \frac{3\pi}{4}\right)$$

$$\left(5, -\frac{\pi}{4}\right), \left(5, \frac{15\pi}{4}\right)$$



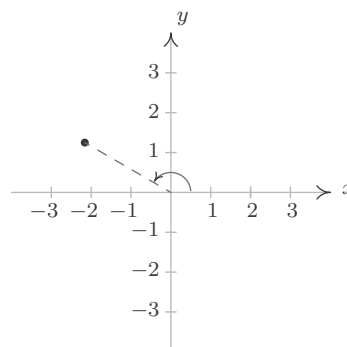
$$3. \left(\frac{1}{3}, \frac{3\pi}{2}\right), \left(-\frac{1}{3}, \frac{\pi}{2}\right)$$

$$\left(\frac{1}{3}, -\frac{\pi}{2}\right), \left(\frac{1}{3}, \frac{7\pi}{2}\right)$$



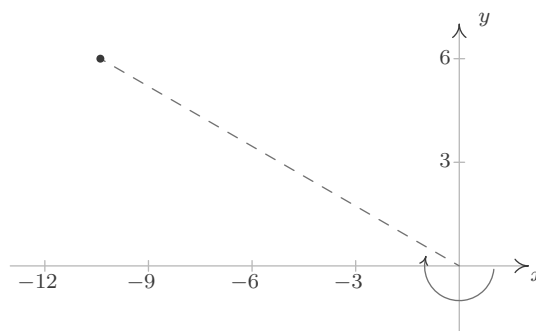
$$4. \left(\frac{5}{2}, \frac{5\pi}{6}\right), \left(-\frac{5}{2}, \frac{11\pi}{6}\right)$$

$$\left(\frac{5}{2}, -\frac{7\pi}{6}\right), \left(\frac{5}{2}, \frac{17\pi}{6}\right)$$



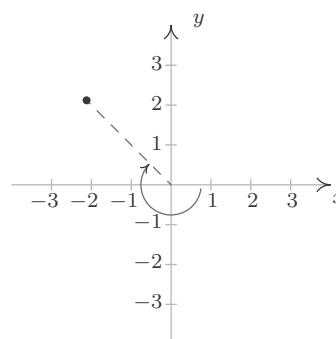
$$5. \left(12, -\frac{7\pi}{6}\right), \left(-12, \frac{11\pi}{6}\right)$$

$$\left(12, -\frac{19\pi}{6}\right), \left(12, \frac{17\pi}{6}\right)$$



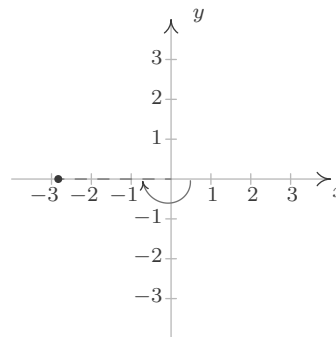
$$6. \left(3, -\frac{5\pi}{4}\right), \left(-3, \frac{7\pi}{4}\right)$$

$$\left(3, -\frac{13\pi}{4}\right), \left(3, \frac{11\pi}{4}\right)$$



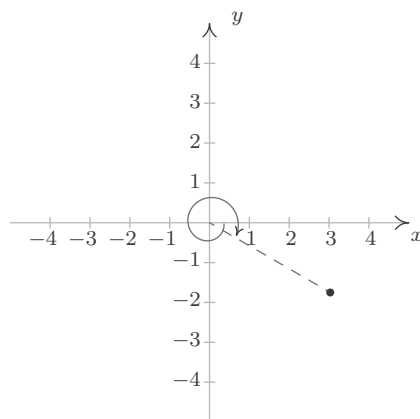
$$7. (2\sqrt{2}, -\pi), (-2\sqrt{2}, 0)$$

$$(2\sqrt{2}, -3\pi), (2\sqrt{2}, 3\pi)$$

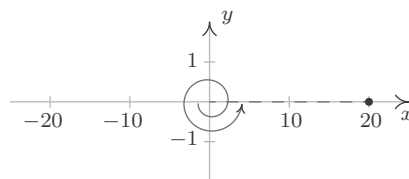


$$8. \left(\frac{7}{2}, -\frac{13\pi}{6}\right), \left(-\frac{7}{2}, \frac{5\pi}{6}\right)$$

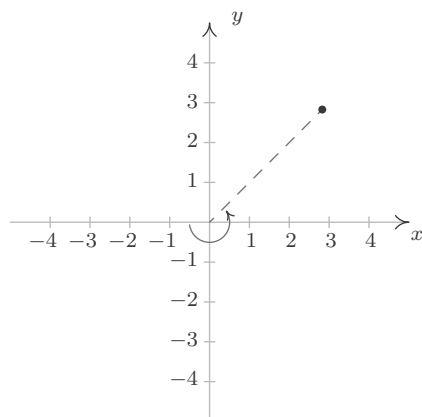
$$\left(\frac{7}{2}, -\frac{\pi}{6}\right), \left(\frac{7}{2}, \frac{23\pi}{6}\right)$$



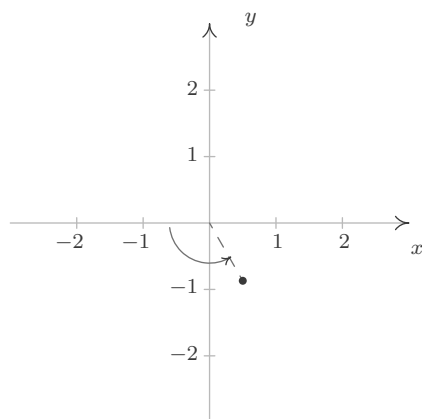
9. $(-20, 3\pi), (-20, \pi)$
 $(20, -2\pi), (20, 4\pi)$



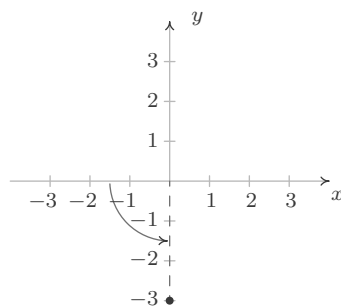
10. $\left(-4, \frac{5\pi}{4}\right), \left(-4, \frac{13\pi}{4}\right)$
 $\left(4, -\frac{7\pi}{4}\right), \left(4, \frac{9\pi}{4}\right)$



11. $\left(-1, \frac{2\pi}{3}\right), \left(-1, \frac{8\pi}{3}\right)$
 $\left(1, -\frac{\pi}{3}\right), \left(1, \frac{11\pi}{3}\right)$

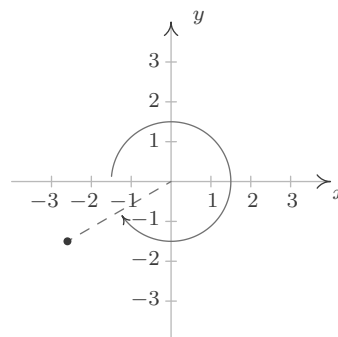


12. $\left(-3, \frac{\pi}{2}\right), \left(-3, \frac{5\pi}{2}\right)$
 $\left(3, -\frac{\pi}{2}\right), \left(3, \frac{7\pi}{2}\right)$



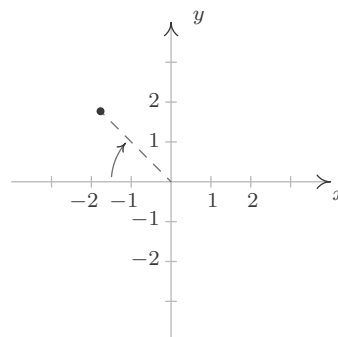
$$13. \left(-3, -\frac{11\pi}{6}\right), \left(-3, \frac{\pi}{6}\right)$$

$$\left(3, -\frac{5\pi}{6}\right), \left(3, \frac{19\pi}{6}\right)$$



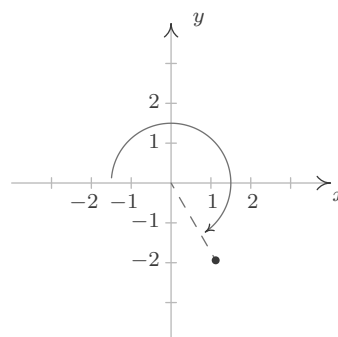
$$14. \left(-2.5, -\frac{\pi}{4}\right), \left(-2.5, \frac{7\pi}{4}\right)$$

$$\left(2.5, -\frac{5\pi}{4}\right), \left(2.5, \frac{11\pi}{4}\right)$$



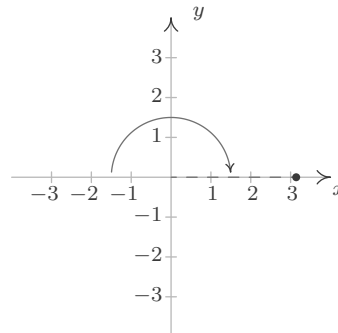
$$15. \left(-\sqrt{5}, -\frac{4\pi}{3}\right), \left(-\sqrt{5}, \frac{2\pi}{3}\right)$$

$$\left(\sqrt{5}, -\frac{\pi}{3}\right), \left(\sqrt{5}, \frac{11\pi}{3}\right)$$



$$16. (-\pi, -\pi), (-\pi, \pi)$$

$$(\pi, -2\pi), (\pi, 2\pi)$$



- | | | | |
|---|---|---|---|
| 17. $\left(\frac{5\sqrt{2}}{2}, -\frac{5\sqrt{2}}{2}\right)$ | 18. $(1, \sqrt{3})$ | 19. $\left(-\frac{11\sqrt{3}}{2}, \frac{11}{2}\right)$ | 20. $(20, 0)$ |
| 21. $\left(0, \frac{3}{5}\right)$ | 22. $(2\sqrt{3}, -2)$ | 23. $(0, -9)$ | 24. $\left(-\frac{5\sqrt{2}}{2}, \frac{5\sqrt{2}}{2}\right)$ |
| 25. $(21\sqrt{3}, 21)$ | 26. $(117, 0)$ | 27. $\left(\frac{6\sqrt{5}}{5}, \frac{12\sqrt{5}}{5}\right)$ | 28. $(\sqrt{10}, 3\sqrt{10})$ |
| 29. $\left(-\frac{9}{5}, -\frac{12}{5}\right)$ | 30. $(3, -4)$ | 31. $\left(-\frac{4\sqrt{5}}{5}, \frac{2\sqrt{5}}{5}\right)$ | 32. $\left(\frac{\sqrt{26}}{52}, -\frac{5\sqrt{26}}{52}\right)$ |
| 33. $\left(\frac{4}{5}, \frac{3}{5}\right)$ | 34. $\left(-\frac{2}{9}, -\frac{4\sqrt{2}}{9}\right)$ | 35. $\left(\frac{\pi}{\sqrt{1+\pi^2}}, \frac{\pi^2}{\sqrt{1+\pi^2}}\right)$ | 36. $(5, 12)$ |
| 37. $\left(5, \frac{\pi}{2}\right)$ | 38. $\left(2\sqrt{3}, \frac{\pi}{6}\right)$ | 39. $\left(7\sqrt{2}, \frac{7\pi}{4}\right)$ | 40. $\left(2\sqrt{3}, \frac{7\pi}{6}\right)$ |
| 41. $(3, \pi)$ | 42. $\left(2, \frac{3\pi}{4}\right)$ | 43. $\left(8, \frac{4\pi}{3}\right)$ | 44. $\left(\frac{1}{2}, \frac{11\pi}{6}\right)$ |
| 45. $\left(\frac{3}{5}, \frac{4\pi}{3}\right)$ | 46. $\left(\sqrt{10}, \frac{5\pi}{4}\right)$ | 47. $\left(10, \arctan\left(\frac{4}{3}\right)\right)$ | 48. $(5, \arctan(2))$ |
| 49. $\left(\sqrt{65}, \pi - \arctan\left(\frac{1}{8}\right)\right)$ | | 50. $(20, \pi - \arctan(3))$ | |
| 51. $\left(13, \pi + \arctan\left(\frac{12}{5}\right)\right)$ | | 52. $\left(\frac{1}{3}, \pi + \arctan(2)\right)$ | |
| 53. $\left(25, 2\pi - \arctan\left(\frac{7}{24}\right)\right)$ | | 54. $\left(15, 2\pi - \arctan\left(\frac{3}{4}\right)\right)$ | |
| 55. $\left(\frac{\sqrt{2}}{2}, \frac{\pi}{3}\right)$ | | 56. $(\sqrt{13}, \pi - \arctan(2))$ | |
| 57. $r = 6 \sec(\theta)$ | 58. $r = -3 \sec(\theta)$ | 59. $r = 7 \csc(\theta)$ | 60. $\theta = 0$ |
| 61. $\theta = \frac{3\pi}{4}$ | 62. $\theta = \frac{\pi}{3}$ | 63. $\theta = \arctan(2)$ | 64. $r = 5$ |
| 65. $r = \sqrt{117}$ | 66. $r = \frac{19}{4 \cos(\theta) - \sin(\theta)}$ | 67. $x = \frac{1}{\cos(\theta) - 3 \sin(\theta)}$ | 68. $r = \frac{-\sec(\theta) \tan(\theta)}{3}$ |
| 69. $r = 4 \csc(\theta) \cot(\theta)$ | 70. $r = 2 \sin(\theta)$ | 71. $r = 4 \cos(\theta)$ | 72. $r = \cos(\theta)$ |

73. $r = 7 \sin(\theta)$

74. $r = -4 \cos(\theta)$

75. $r = 6 \sin(\theta)$

76. $r = \sin(\theta)$

77. $x^2 + y^2 = 49$

78. $x^2 + y^2 = 9$

79. $x^2 + y^2 = 2$

80. $y = x$

81. $y = -\sqrt{3}x$

82. $y = 0$

83. $x = 0$

84. $x^2 + y^2 = 4x$ or $(x - 2)^2 + y^2 = 4$

85. $5x^2 + 5y^2 = x$ or $\left(x - \frac{1}{10}\right)^2 + y^2 = \frac{1}{100}$

86. $x^2 + y^2 = 3y$ or $x^2 + \left(y - \frac{3}{2}\right)^2 = \frac{9}{4}$

87. $x^2 + y^2 = -2y$ or $x^2 + (y + 1)^2 = 1$

88. $x = 7$

89. $y = \frac{1}{12}$

90. $x = -2$

91. $y = -\sqrt{5}$

92. $x^2 = 2y$

93. $y^2 = -x$

94. $(x^2 + y^2)^2 = 2xy$

95. $(x^2 + 2x + y^2)^2 = x^2 + y^2$

96. $(x^2 + y^2 + y)^2 = x^2 + y^2$