

GRAPHING Graph the equation. Identify the radius of the circle.

9. $x^2 + y^2 = 1$ 10. $x^2 + y^2 = 81$ 11. $x^2 + y^2 = 25$
 12. $x^2 + y^2 = 12$ 13. $y^2 = 27 - x^2$ 14. $x^2 = -y^2 + 40$
 15. $x^2 = 15 - y^2$ 16. $y^2 = -x^2 + 9$ 17. $15x^2 + 15y^2 = 60$
 18. $7x^2 + 7y^2 = 112$ 19. $4x^2 + 4y^2 = 128$ 20. $8x^2 + 8y^2 = 192$

21. ★ **MULTIPLE CHOICE** What is the radius of the circle $3x^2 + 3y^2 = 54$?

- (A) $3\sqrt{2}$ (B) $3\sqrt{6}$ (C) 18 (D) 54

WRITING EQUATIONS Write the standard form of the equation of the circle with the given radius and whose center is the origin.

22. 12 23. 8 24. 2 25. 16
 26. $\sqrt{2}$ 27. $\sqrt{15}$ 28. $5\sqrt{2}$ 29. $4\sqrt{6}$

30. **ERROR ANALYSIS** Describe and correct the error in writing an equation of the circle with the given center and radius.

Center: $(0, 0)$; Radius: 12
 Equation: $x^2 + y^2 = 12$

WRITING EQUATIONS Write the standard form of the equation of the circle that passes through the given point and whose center is the origin.

31. $(-6, 0)$ 32. $(0, 5)$ 33. $(-4, 3)$ 34. $(2, -4)$
 35. $(-6, 8)$ 36. $(-9, 2)$ 37. $(4, -10)$ 38. $(-8, -5)$
 39. $(-8, 14)$ 40. $(5, -12)$ 41. $(-11, -11)$ 42. $(9, 40)$

43. ★ **MULTIPLE CHOICE** What is the equation in standard form of the circle that passes through the point $(4, -6)$ and whose center is the origin?

- (A) $x^2 + y^2 = 5$ (B) $x^2 + y^2 = 10$ (C) $x^2 + y^2 = 52$ (D) $x^2 + y^2 = 2\sqrt{13}$

GRAPHING In Exercises 44–52, equations of both circles and parabolas are given. Graph the equation.

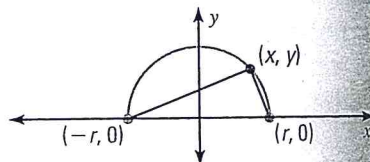
44. $y^2 + x^2 = 49$ 45. $4x^2 + y = 0$ 46. $7x^2 + 7y^2 = 63$
 47. $y^2 - 121 = -x^2$ 48. $x^2 + 16y = 0$ 49. $3x = -y^2$
 50. $12x^2 + 12y^2 = 192$ 51. $2x^2 + 2y^2 = 16$ 52. $6x + 6y^2 = 0$

TANGENT LINES Write an equation of the line tangent to the given circle at the given point.

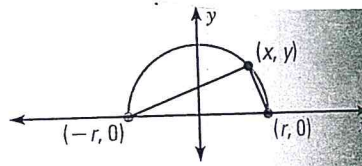
53. $x^2 + y^2 = 17$; $(1, 4)$ 54. $x^2 + y^2 = 13$; $(2, -3)$ 55. $x^2 + y^2 = 34$; $(-5, 3)$
 56. $x^2 + y^2 = 40$; $(-6, -2)$ 57. $x^2 + y^2 = 106$; $(-5, 9)$ 58. $x^2 + y^2 = 250$; $(15, 5)$

59. ★ **OPEN-ENDED MATH** Write equations in standard form for three circles centered at the origin so that each circle passes between $(-3, 5)$ and $(-6, 2)$.

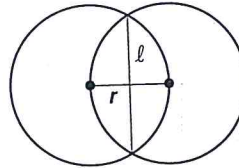
60. **REASONING** Use the diagram to show that an angle inscribed in a semicircle is a right angle. (Hint: Show that the segments meeting at (x, y) have slopes that are negative reciprocals.)



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61. **CHALLENGE** Suppose two congruent circles intersect so that each passes through the other's center, as shown. Write an equation that gives the length ℓ of the chord formed by joining the intersection points in terms of the radius r of each circle.



PROBLEM SOLVING

62. **CELL PHONES** A cellular phone tower services a 15 mile radius. On a hiking trip, you are 9 miles east and 11 miles north of the cell tower. Are you in the region served by the tower?

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63. **BATS** During the warmer months, more than 1 million Mexican free-tailed bats live under the Congress Avenue Bridge in Austin, Texas. The bats have an estimated feeding range of 50 miles. Is a location 40 miles north and 25 miles west of the bridge located within this range?

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