9.7 EXERCISES

PRACTICE

Use graphing to approximate the real solution(s) of the following systems, and then verify that your answers are correct. See Examples 1 and 2.

1. $\begin{cases} 3x-2y=6 \\ \dfrac{x^2}{4}+\dfrac{y^2}{9}=1 \end{cases}$

2. $\begin{cases} x+2y=2 \\ \dfrac{x^2}{4}+y^2=1 \end{cases}$

3. $\begin{cases} x^2+4y^2=5 \\ x^2+y^2=2 \end{cases}$

4. $\begin{cases} 4x^2+y^2=5 \\ 4(x-2)^2+y^2=5 \end{cases}$

5. $\begin{cases} y=x^2 \\ 2-y=x^2 \end{cases}$

6. $\begin{cases} x^2+(y-1)^2=4 \\ (x-3)^2+(y-1)^2=1 \end{cases}$

7. $\begin{cases} y-x^2=1 \\ y+2=4x^2 \end{cases}$

8. $\begin{cases} x^2+y^2=10 \\ x^2+y=-2 \end{cases}$

9. $\begin{cases} x=y^2-3 \\ x^2+4y^2=4 \end{cases}$

10. $\begin{cases} (x-1)^2+(y-6)^2=9 \\ (x-1)^2+(y+1)^2=16 \end{cases}$

11. $\begin{cases} (x+1)^2+(y-1)^2=4 \\ (x+1)^2+4(y-1)^2=4 \end{cases}$

12. $\begin{cases} x^2+y^2=1 \\ y=x^2-1 \end{cases}$

13. $\begin{cases} (x-2)^2+y^2=4 \\ (x+2)^2+y^2=4 \end{cases}$

14. $\begin{cases} x^2+y^2=9 \\ x^2+y^2-2x-3=1 \end{cases}$

15. $\begin{cases} x^2+y^2=9 \\ \dfrac{x^2}{9}+\dfrac{y^2}{25}=1 \end{cases}$

16. $\begin{cases} x^2+y^2=4 \\ -x^2=2y-1 \end{cases}$

17. $\begin{cases} x^2+\dfrac{y^2}{4}=1 \\ y=0 \end{cases}$

18. $\begin{cases} y=x^2+1 \\ y-1=x^3 \end{cases}$

19. $\begin{cases} 2y^2-3x^2=6 \\ 2y^2+x^2=22 \end{cases}$

20. $\begin{cases} y=x^3 \\ y=\sqrt[3]{x} \end{cases}$

21. $\begin{cases} x=y^2-4 \\ x+13=6y \end{cases}$

22. $\begin{cases} y=2x^2-3 \\ y=-x^2 \end{cases}$

23. $\begin{cases} 2y=x^2-4 \\ x^2+y^2=4 \end{cases}$

24. $\begin{cases} x^2-y^2=5 \\ \dfrac{x^2}{25}+\dfrac{4y^2}{25}=1 \end{cases}$

Solve the following systems of nonlinear equations. Be sure to check for nonreal solutions. See Examples 3, 4, and 5.

25. $\begin{cases} x^2 + y^2 = 30 \\ x^2 = y \end{cases}$

26. $\begin{cases} 3x^2 + 2y^2 = 12 \\ x^2 + 2y^2 = 4 \end{cases}$

27. $\begin{cases} x^2 - 1 = y \\ 4x + y = -5 \end{cases}$

28. $\begin{cases} x^2 + y^2 = 4 \\ 3x^2 + 4y^2 = 24 \end{cases}$

29. $\begin{cases} y = \dfrac{4}{x} \\ 2x^2 + y^2 = 18 \end{cases}$

30. $\begin{cases} xy = 5 \\ x^2 + y^2 = 10 \end{cases}$

31. $\begin{cases} y - x^2 = 4 \\ x^2 + y^2 = 16 \end{cases}$

32. $\begin{cases} y - x^2 = 6x \\ y = 4x \end{cases}$

33. $\begin{cases} 2x^2 + 3y^2 = 6 \\ x^2 + 3y^2 = 3 \end{cases}$

34. $\begin{cases} x^2 + y^2 = 4 \\ \dfrac{x^2}{4} - \dfrac{y^2}{8} = 1 \end{cases}$

35. $\begin{cases} 3x^2 - y = 3 \\ 9x^2 + y^2 = 27 \end{cases}$

36. $\begin{cases} \dfrac{1}{x} + \dfrac{1}{y} = 5 \\ \dfrac{1}{x} - \dfrac{1}{y} = -3 \end{cases}$

37. $\begin{cases} x + y^2 = 2 \\ 2x^2 - y^2 = 1 \end{cases}$

38. $\begin{cases} y - 2 = (x+3)^2 \\ \dfrac{1}{3}y = (x-1)^2 \end{cases}$

39. $\begin{cases} y - 2 = (x-2)^2 \\ y + 2 = (x-1)^2 \end{cases}$

40. $\begin{cases} y^2 + 2 = 2x^2 \\ y^2 = x^2 - 6 \end{cases}$

41. $\begin{cases} (x+1)^2 + y^2 = 10 \\ \dfrac{(x-2)^2}{4} + y^2 = 1 \end{cases}$

42. $\begin{cases} x^2 + y^2 = 10 \\ x^2 + y = 8 \end{cases}$

43. $\begin{cases} 2x = y - 1 \\ \dfrac{x^2}{25} + y^2 = 1 \end{cases}$

44. $\begin{cases} 2x^2 + y^2 = 4 \\ 2(x-1)^2 + y^2 = 3 \end{cases}$

45. $\begin{cases} x^2 + 7y^2 = 14 \\ x^2 + y^2 = 3 \end{cases}$

46. $\begin{cases} x^2 + y^2 = 25 \\ y^2 = x - 5 \end{cases}$

47. $\begin{cases} y = x^3 + 8x^2 + 17x + 10 \\ -y = x^3 + 8x^2 + 17x + 10 \end{cases}$

48. $\begin{cases} \dfrac{x^2}{25} + \dfrac{y^2}{16} = 1 \\ x^2 + y^2 = 16 \end{cases}$

49. $\begin{cases} xy = 6 \\ (x-2)^2 + (y-2)^2 = 1 \end{cases}$

50. $\begin{cases} y^2 = x+1 \\ \frac{x^2}{5} + \frac{y^2}{6} = 1 \end{cases}$

51. $\begin{cases} y = x^3 - 1 \\ 3y = 2x - 3 \end{cases}$

52. $\begin{cases} y+5 = (x+1)^2 \\ y-3 = (x-3)^2 \end{cases}$

53. $\begin{cases} xy - y = 4 \\ (x-1)^2 + y^2 = 10 \end{cases}$

54. $\begin{cases} 2x^2 + 5y^2 = 16 \\ 4x^2 + 3y^2 = 4 \end{cases}$

55. $\begin{cases} y = \sqrt{x-4} + 1 \\ (x-3)^2 + (y-1)^2 = 1 \end{cases}$

56. $\begin{cases} y = \sqrt[3]{x} \\ \sqrt{y} = x \end{cases}$

57. $\begin{cases} y^2 - y - 12 = x - x^2 \\ y - 1 + \frac{2x-12}{y} = 0 \end{cases}$

58. $\begin{cases} y = 7x^2 + 1 \\ x^2 + y^2 = 1 \end{cases}$

59. $\begin{cases} \frac{(y+2)^2}{(x+y)} = 1 \\ x = y^2 + 5y + 4 \end{cases}$

60. $\begin{cases} x = \sqrt{6y+1} \\ y = \sqrt{\frac{x^2+7}{2}} \end{cases}$

61. $\begin{cases} \frac{-2}{x^2} + \frac{1}{y^2} = 8 \\ \frac{9}{x^2} - \frac{2}{y^2} = 4 \end{cases}$

62. $\begin{cases} x^2 + 3x - 2y^2 = 5 \\ -4x^2 + 6y^2 = 3 \end{cases}$

Draw the graph and determine whether the ordered pairs are solutions to the system of inequalities.

63. $\begin{cases} x \geq 3 \\ y > 4 \end{cases}$ **a.** $(2,5)$ **b.** $(7,8)$ **c.** $(5,0)$ **d.** $(3,4)$

64. $\begin{cases} y \leq 2x + 1 \\ y < 4 \\ y > x \end{cases}$ **a.** $(1,2)$ **b.** $(3,4)$ **c.** $(-1,-1)$ **d.** $(3,3)$

65. $\begin{cases} y \geq x^2 \\ y < x^3 \\ y \leq 4x \end{cases}$ **a.** $(2,2)$ **b.** $(2,4)$ **c.** $(2,8)$ **d.** $(3,9)$

66. $\begin{cases} y \geq x^2 - 2 \\ y \leq (x-2)^2 \\ 3y > 2x + 12 \end{cases}$ **a.** $(2,5)$ **b.** $(7,8)$ **c.** $(5,0)$ **d.** $(3,4)$

67. $\begin{cases} x < 4 \\ y \geq \sqrt{x} \\ 2y > -x \end{cases}$ **a.** $(2,5)$ **b.** $(7,8)$ **c.** $(5,0)$ **d.** $(3,4)$

Graph the following systems of inequalities. See Example 6.

68. $\begin{cases} y < 2x \\ y > x^2 \end{cases}$ **69.** $\begin{cases} y \leq 2x+3 \\ y \geq 0 \\ x \geq 0 \end{cases}$ **70.** $\begin{cases} y > x^2 \\ -3y \leq x-9 \end{cases}$

71. $\begin{cases} y \leq x \\ 2y > -x \\ x < 4 \end{cases}$ **72.** $\begin{cases} y \leq \sqrt{x} \\ 2y > (x-1)^2 - 4 \end{cases}$ **73.** $\begin{cases} y > x^3 \\ y \leq \sqrt[3]{x} \\ y > 0 \end{cases}$

74. $\begin{cases} y \geq x^3 \\ y \geq -x^3 \\ y < 2(x+1) \end{cases}$ **75.** $\begin{cases} x^2 + y^2 < 9 \\ -4y \geq x - 12 \end{cases}$ **76.** $\begin{cases} y \leq \sin x \\ x \geq 0 \end{cases}$

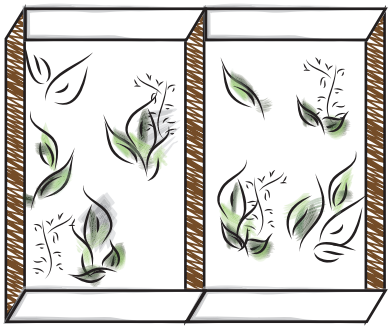
APPLICATIONS

77. The area of a certain rectangle is 45 square inches, and its perimeter is 28 inches. Find the dimensions of the rectangle.

78. The product of two positive integers is 88, and their sum is 19. What are the integers?

79. Jack takes half an hour longer than his wife does to make the 210-mile drive between two cities. His wife drives 10 miles an hour faster. How fast do the two drive?

80. To construct the two garden beds shown below, 48.5 meters of fencing are needed. The combined area of the beds is 95 square meters. There are two possibilities for the overall dimensions of the two beds. What are they?



81. The product of two integers is –84, and their sum is –5. What are the integers?

82. Paul and Maria were driving the same 24-mile route, and they departed at the same time. After 20 minutes, Maria was 4 miles ahead of Paul. If it took Paul 10 minutes longer to reach their destination, how fast were they each driving?

83. The surface area of a certain right circular cylinder is $54\pi \text{ cm}^2$ and the volume is $54\pi \text{ cm}^3$. Find the height h and the radius r of this cylinder. (**Hint:** The formulas for the volume and surface area of a right circular cylinder are as follows: $V = \pi r^2 h$ and $SA = 2\pi rh + 2\pi r^2$.)