Solve the equation.

1) $\dfrac{x}{9} = \dfrac{x}{4} + \dfrac{7}{9}$

2) $\dfrac{x + 7}{4} = 2 - \dfrac{x - 1}{6}$

3) $\dfrac{7}{x} = \dfrac{1}{2x} + 52$

4) $\dfrac{30}{x - 4} + 5 = \dfrac{15}{x - 4}$

5) $\dfrac{1}{x + 7} + \dfrac{3}{x + 4} = \dfrac{-3}{x^2 + 11x + 28}$

6) $2x^4 = 128x$

7) $5x - 2 = 125x^3 - 50x^2$

8) $12x^3 + 84x^2 + 120x = 0$

9) $\sqrt{9x + 36} = x$

10) $(9x + 3)^2 = 4$

11) $3x^2 + 8x = -1$

12) $2x^2 = 22$

13) $\sqrt{2x} + 6 = x + 2$

14) $\sqrt{2x + 3} - \sqrt{x + 1} = 1$

15) $x^{3/2} = 125$

16) $(5x + 3)^{1/3} = 3$

17) $(x^2 + 14x + 49)^{3/4} - 20 = 7$

18) $x^4 - 7x^2 + 12 = 0$

19) $x^{2/5} - x^{1/5} - 12 = 0$

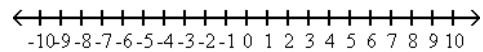20) $(x + 5)^2 - 4(x + 5) + 3 = 0$

21) $e^{2x} + e^x - 6 = 0$

22) $|7x + 8| = 5$

23) $|8x + 9| + 5 = 9$

24) $|2x + 2| = |x + 2|$

Solve the absolute value inequality. Other than ∅, use interval notation to express the solution set and graph the solution set on a number line.

25) $5 + \left|1 - \dfrac{x}{2}\right| \geq 8$

Solve the equation by completing the square.

26) $7x^2 - 2x - 4 = 0$

Solve the formula for the specified variable.

27) $\dfrac{1}{a} + \dfrac{1}{b} = \dfrac{1}{c}$ for c

28) $P = \dfrac{A}{1 + rt}$ for t

29) $I = \dfrac{nE}{nr + R}$ for n

Perform the indicated operations and write the result in standard form.

41) $(-4 - \sqrt{-36})^2$

Solve the polynomial equation. In order to obtain the first root, use synthetic division to test the possible rational roots.

42) $\sqrt{-9}(5 - \sqrt{-81})$

30) $3x^3 - x^2 - 21x + 7 = 0$

43) $(\sqrt{-16})(\sqrt{-4})$

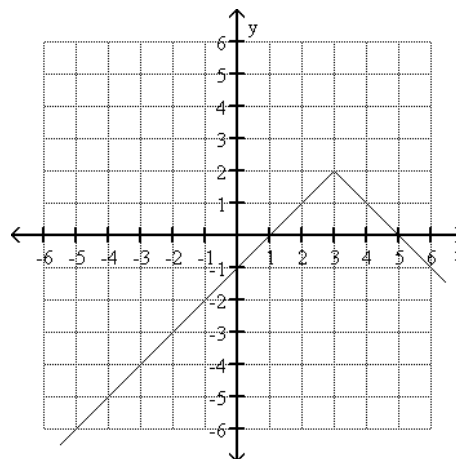Solve the equation by expressing each side as a power of the same base and then equating exponents.

31) $2^{(7 - 3x)} = \dfrac{1}{4}$

Evaluate the function at the given value of the independent variable and simplify.

44) $f(x) = x^2 - 1;$ $f(x + 3)$

32) $4^{x + 10} = 8^{x - 6}$

Use the graph to determine the function's domain and range.

45)

Solve the exponential equation. Express the solution set in terms of natural logarithms.

33) $2^{x + 8} = 3$

Solve the exponential equation. Use a calculator to obtain a decimal approximation, correct to two decimal places, for the solution.

34) $7^x = 6^{x + 7}$

Solve the logarithmic equation. Be sure to reject any value that is not in the domain of the original logarithmic expressions. Give the exact answer.

35) $\ln \sqrt{x + 6} = 9$

36) $\log_7 x + \log_7 (x - 48) = 2$

Find the product and write the result in standard form.

37) $(4 - 9i)(-2 + 6i)$

Find and simplify the difference quotient $\dfrac{f(x + h) - f(x)}{h}$, $h \neq 0$ for the given function.

46) $f(x) = 8x + 9$

47) $f(x) = 5x^2$

38) $(9 + 8i)^2$

Divide and express the result in standard form.

48) $f(x) = \dfrac{1}{2x}$

39) $\dfrac{6}{8 + i}$

Use the given conditions to write an equation for the line in point-slope form.

49) Passing through (8, 5) and (4, 2)

40) $\dfrac{3 - 3i}{5 - 3i}$
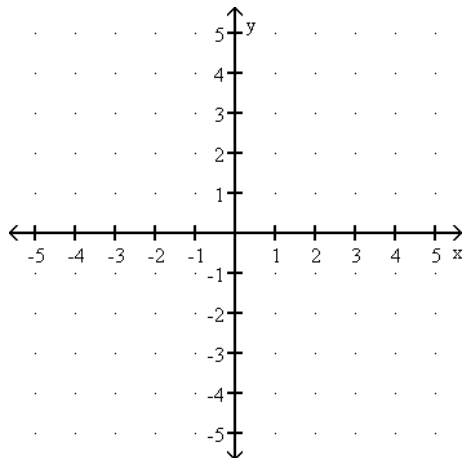
50) Passing through (2, -3) with x-intercept = -2

Use the given conditions to write an equation for the line in slope-intercept form.
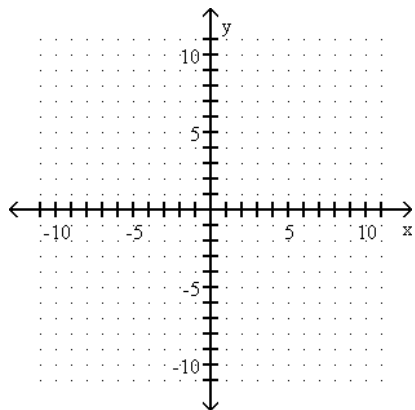
51) Passing through $(-3, 5)$ and $(2, 7)$

Graph the equation in the rectangular coordinate system.
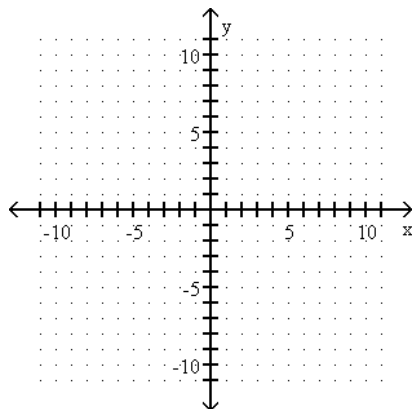
52) $f(x) = -4$

53) $-6x - 3 = 45$

Graph the linear function by plotting the x- and y-intercepts.

54) $-\frac{1}{3}x + y - 3 = 0$

Solve.

55) A faucet is used to add water to a large bottle that already contained some water. After it has been filling for 3 seconds, the gauge on the bottle indicates that it contains 10 ounces of water. After it has been filling for 11 seconds, the gauge indicates the bottle contains 26 ounces of water. Let y be the amount of water in the bottle x seconds after the faucet was turned on. Write a linear equation that models the amount of water in the bottle in terms of x. Interpret the slope in a sentence.

Use the given conditions to write an equation for the line in the indicated form.

56) Passing through $(4, 5)$ and parallel to the line whose equation is $y = 2x - 6$;
point-slope form

57) Passing through $(4, 5)$ and perpendicular to the line whose equation is $y = \frac{1}{8}x + 8$;
slope-intercept form

For the given functions f and g , find the indicated composition.

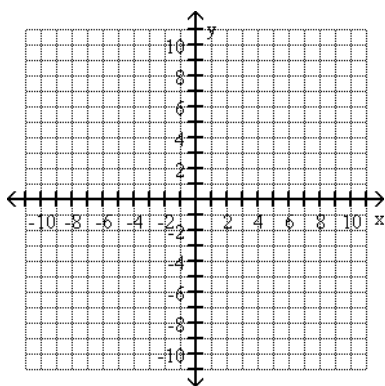58) $f(x) = -5x + 3, \quad g(x) = 6x + 3$
$(g \circ f)(x)$

59) $f(x) = \frac{6}{x + 3}, \quad g(x) = \frac{2}{3x}$
$(f \circ g)(x)$

Find functions f and g so that $h(x) = (f \circ g)(x)$.
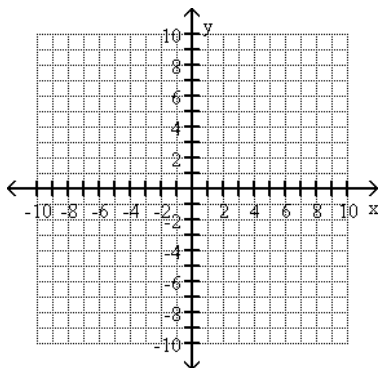
60) $h(x) = \frac{1}{x^2 - 2}$

3

Begin by graphing the standard quadratic function $f(x) = x^2$. Then use transformations of this graph to graph the given function.

61) $h(x) = -(x + 2)^2 + 4$

Begin by graphing the standard square root function $f(x) = \sqrt{x}$. Then use transformations of this graph to graph the given function.

62) $g(x) = -\sqrt{x + 2} - 1$

Find the distance between the pair of points.

63) $(-2, -5)$ and $(2, 3)$

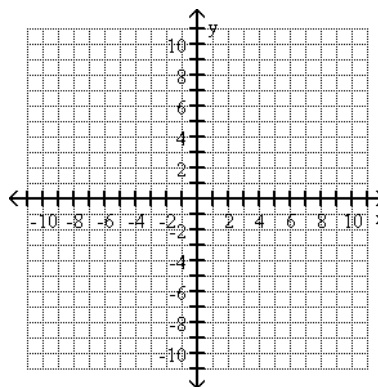Find the midpoint of the line segment whose end points are given.

64) $(8, 1)$ and $(7, 9)$

Complete the square and write the equation in standard form. Then give the center and radius of the circle.

65) $x^2 + y^2 - 14x - 2y + 50 = 4$

Begin by graphing the standard absolute value function $f(x) = |x|$. Then use transformations of this graph to graph the given function.

66) $g(x) = \frac{1}{2}|x - 3| - 2$

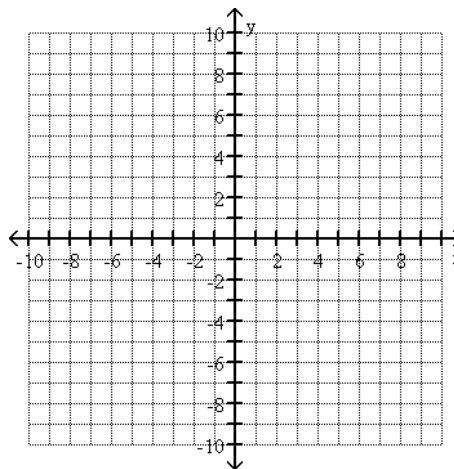Find the inverse of the one-to-one function.

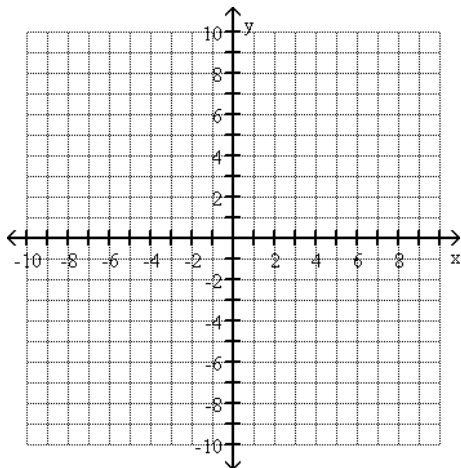67) $f(x) = \dfrac{8x - 5}{3}$

68) $f(x) = \dfrac{4}{5x - 1}$

69) $f(x) = (x - 4)^3$

Graph f as a solid line and f^{-1} as a dashed line in the same rectangular coordinate space. Use interval notation to give the domain and range of f and f^{-1}.
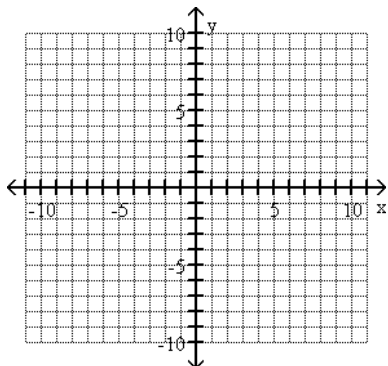
70) $f(x) = x^2 - 1, x \geq 0$
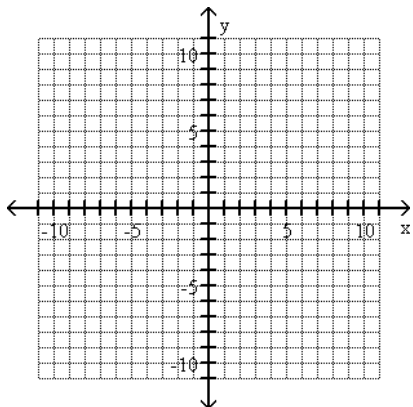
71) $f(x) = \sqrt[3]{x} + 2$

Graph the equation.

72) $x^2 + y^2 - 10x - 2y + 17 = 0$

Use the vertex and intercepts to sketch the graph of the quadratic function.

73) $f(x) = -x^2 - 4x + 5$

Solve the problem.

74) A developer wants to enclose a rectangular grassy lot that borders a city street for parking. If the developer has 336 feet of fencing and does not fence the side along the street, what is the largest area that can be enclosed?

75) You inherit $10,000 with the stipulation that for the first year the money must be invested in two stocks paying 6% and 11% annual interest, respectively. How much should be invested at each rate if the total interest earned for the year is to be $800?

76) A 16-foot pole is supported by two wires that extend from the top of the pole to points that are each 8 feet from the base of the pole. Find the total length of the two wires.

77) The length of a rectangular storage room is 4 feet longer than its width. If the area of the room is 60 square feet, find its dimensions.

78) You have 108 feet of fencing to enclose a rectangular plot that borders on a river. If you do not fence the side along the river, find the length and width of the plot that will maximize the area.

79) An arrow is fired into the air with an initial velocity of 64 feet per second. The height in feet of the arrow t seconds after it was shot into the air is given by the function $h(x) = -16t^2 + 64t$. Find the maximum height of the arrow.

80) An object is propelled vertically upward from the top of a 144-foot building. The quadratic function $s(t) = -16t^2 + 160t + 144$ models the ball's height above the ground, s(t), in feet, t seconds after it was thrown. How many seconds does it take until the object finally hits the ground? Round to the nearest tenth of a second if necessary.
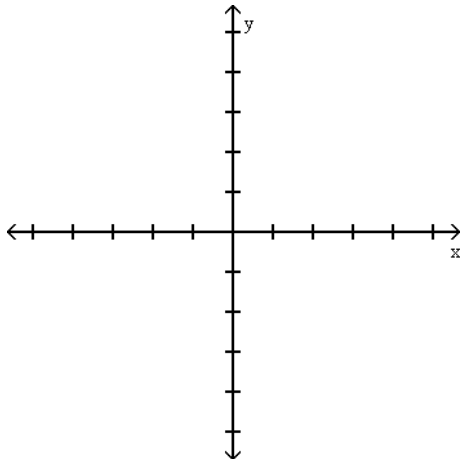
Complete the following:

(a) Use the Leading Coefficient Test to determine the graph's end behavior.

(b) Find the x-intercepts. State whether the graph crosses the x-axis or touches the x-axis and turns around at each intercept.
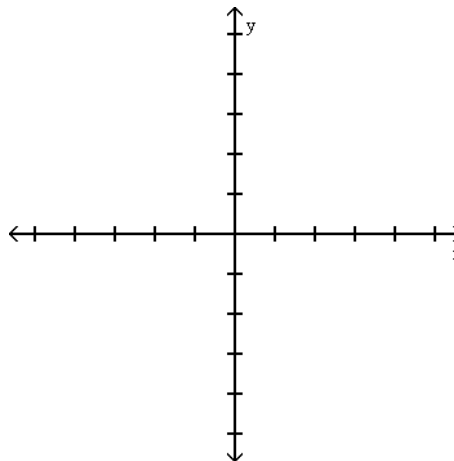
(c) Find the y-intercept.

(d) Graph the function.

81) $f(x) = x^2(x + 2)$
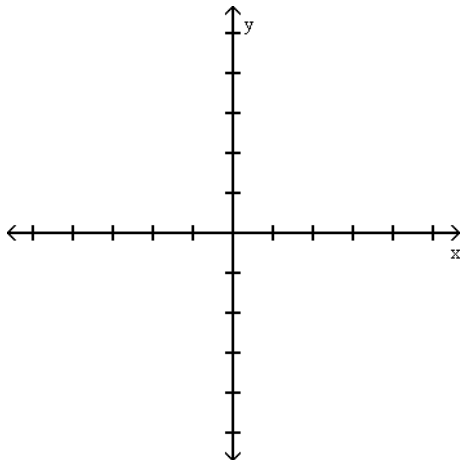
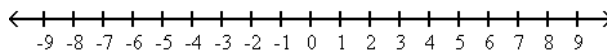82) $f(x) = (x + 1)(x - 3)^2$

83) $f(x) = -2(x - 3)(x + 2)^3$

Find all zeros of the function and write the polynomial as a product of linear factors.
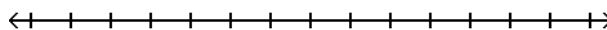
84) $f(x) = x^3 - x^2 + 16x - 16$

Solve the polynomial inequality and graph the solution set on a number line. Express the solution set in interval notation.
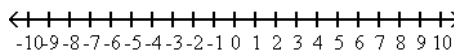
85) $x^2 - 4x \le -3$

86) $x^3 + 4x^2 - x - 4 > 0$

Solve the rational inequality and graph the solution set on a real number line. Express the solution set in interval notation.

87) $\dfrac{x}{x + 3} \ge 2$

Solve the problem.

88) The pressure of a gas varies jointly as the amount of the gas (measured in moles) and the temperature and inversely as the volume of the gas. If the pressure is 1428 kPa (kiloPascals) when the number of moles is 5, the temperature is 340° Kelvin, and the volume is 400 cc, find the pressure when the number of moles is 7, the temperature is 290° K, and the volume is 420 cc.

Graph the function.

89) Use the graph of $f(x) = 4^x$ to obtain the graph of $g(x) = 4^{x-3}$.
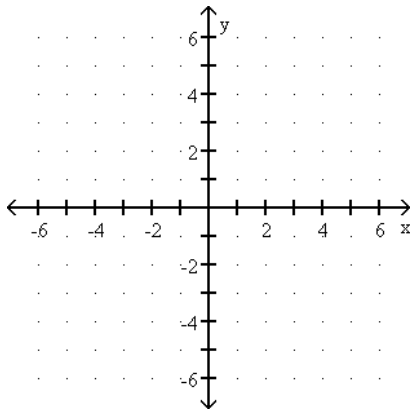
90) Use the graph of $f(x) = 2^x$ to obtain the graph of $g(x) = 2^{x+1} + 2$.
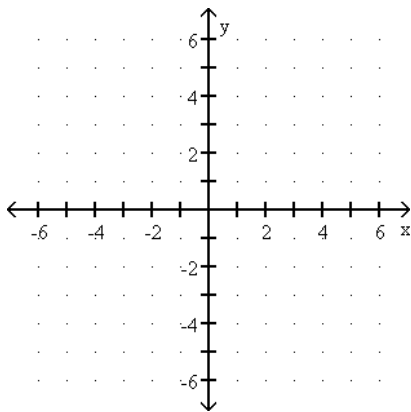
Use the compound interest formulas $A = P\left(1 + \dfrac{r}{n}\right)^{nt}$ and $A = Pe^{rt}$ to solve.

91) Suppose that you have $8000 to invest. Which investment yields the greater return over 9 years: 6.25% compounded continuously or 6.3% compounded semiannually?

Evaluate the expression without using a calculator.

92) $\log_7 \dfrac{1}{\sqrt{7}}$

93) $9^{\log_9 10}$

Graph the function.

94) Use the graph of $f(x) = \log x$ to obtain the graph of $g(x) = 5 - \log x$.
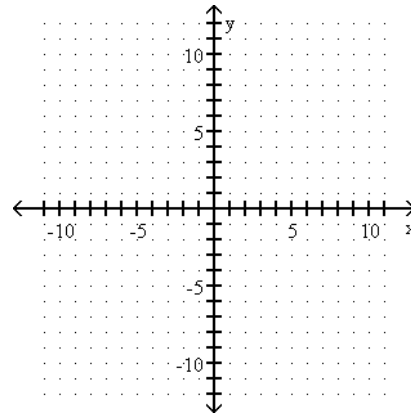
Find the domain of the logarithmic function.

95) $f(x) = \log(x^2 - 17x + 72)$

Evaluate or simplify the expression without using a calculator.

96) $\ln e$

Use properties of logarithms to expand the logarithmic expression as much as possible. Where possible, evaluate logarithmic expressions without using a calculator.

97) $\log_5\left(\dfrac{625}{\sqrt{x-1}}\right)$

98)

$\log_4 \sqrt[3]{\dfrac{x^2 y}{16}}$

Use common logarithms or natural logarithms and a calculator to evaluate to four decimal places

99) $\log_5 24$

Solve the logarithmic equation. Be sure to reject any value that is not in the domain of the original logarithmic expressions. Give the exact answer.

100) $\log (5 + x) - \log (x - 5) = \log 3$

101) $\ln (x - 6) + \ln (x + 1) = \ln (x - 15)$

Solve.

102) A fossilized leaf contains 6% of its normal amount of carbon 14. How old is the fossil (to the nearest year)? Use 5600 years as the half-life of carbon 14.

103) An endangered species of fish has a population that is decreasing exponentially $(A = A_0 e^{kt})$. The population 9 years ago was 1900. Today, only 700 of the fish are alive. Once the population drops below 100, the situation will be irreversible. When will this happen, according to the model? (Round to the nearest whole year.)

Solve the problem.

104) The Family Fine Arts Center charges $23 per adult and $15 per senior citizen for its performances. On a recent weekend evening when 484 people paid admission, the total receipts were $8500. How many who paid were senior citizens?

105) Julie and Eric row their boat (at a constant speed) 32 miles downstream for 4 hours, helped by the current. Rowing at the same rate, the trip back against the current takes 8 hours. Find the rate of the current.

106) Jarod is having a problem with rabbits getting into his vegetable garden, so he decides to fence it in. The length of the garden is 7 feet more than 2 times the width. He needs 44 feet of fencing to do the job. Find the length and width of the garden.

107) A twin-engined aircraft can fly 952 miles from city A to city B in 4 hours with the wind and make the return trip in 7 hours against the wind. What is the speed of the wind?

108) The average value of a certain type of automobile was $14,040 in 1995 and depreciated to $5760 in 1999. Let y be the average value of the automobile in the year x, where x = 0 represents 1995. Write a linear equation that models the value of the automobile in terms of the year x, then interpret the slope.

109) Matt and Cindy, working together, can clean the house in 8 hours. Working alone, Cindy takes four times as long as Matt. How long does it take Matt to clean the house alone?

110) A boat can travel 41 mph in still water. If it travels 315 miles with the current in the same length of time it travels 259 miles against the current, what is the speed of the current?

Solve the problem.

111) A basketball player scored 28 points in a game. The number of three-point field goals the player made was 22 less than three times the number of free throws (each worth 1 point). Twice the number of two-point field goals the player made was 12 more than the number of three-point field goals made. Find the number of free-throws, two-point field goals, and three-point field goals that the player made in the game.

112) The Little Town Arts Center charges $22 for adults, $14 for senior citizens, and $6 for children under 12 for their live performances on Sunday afternoon. This past Sunday, the paid revenue was $11,986 for 879 tickets sold. There were 40 more children than adults. How many children attended?

113) An object is propelled vertically upward from the top of a 64-foot building. The quadratic function $s(t) = -16t^2 + 192t + 64$ models the ball's height above the ground, $s(t)$, in feet, t seconds after it was thrown. Round answers to the nearest tenth of a second if needed.

a)After how many seconds does the object reach its maximum height?

b) What is the maximum hetght?

c) When will the arrow hit the ground?

119) $-x + 6y < -30$
$x \geq 4$
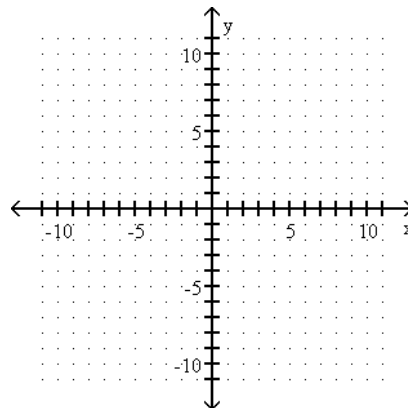
Solve the system by the substitution method.

114) $x^2 + y^2 = 41$
$x + y = 9$

115) $xy = 30$
$x^2 + y^2 = 109$

Solve the system by the addition method.

116) $x^2 - 3y^2 = 1$
$3x^2 + 3y^2 = 15$

117) $2x^2 + y^2 = 66$
$x^2 + y^2 = 41$

Graph the solution set of the system of inequalities or indicate that the system has no solution.

118) $y < x + 1$
$5x + 5y > 35$