For Problems 1 - 3, simplify and express the answer using positive exponents only:

1. \((7x^3y^{-1})(5x^{-1}y^{-4})\)

2. \((4x^2y^{-1})^2\)

3. \(\frac{18a^{-7}b^4c^2}{24a^{-4}b^4c^{-3}}\)

4. Give the slope and y-intercept, and graph the line with equation: \(3y = -2x - 9\)

5. Find the x- and y-intercepts and graph: \(2x - 3y = 15\)

6. Graph and give the slope for each line:
   a. \(y = -2\)
   b. \(2x - 8 = 0\)

7. Write an equation for the line containing the points (4,–6) and (–8,3).

8. Identify the slope and y-intercept for this line.
   Then give the equation in slope-intercept form.

9. Write the equation (in slope-intercept form) for the line through the point (–3,5) perpendicular to \(2y + 3x = 4\).

10. Write the equation (in slope-intercept form) for the line through the point (2,–5) parallel to the line through the points (1,2) and (–3,–1).

11. Determine without graphing whether the pair of lines is parallel or perpendicular: \(5y + 7 = 8x\), and \(-8x + 5y = -15\)

12. Determine if the following relations represent functions or not. For the ones that are functions, give domain and range.
   a) \(\{(4,1),(5,2),(6,3)\}\)
   b) \(\{(3,5),(4,5),(3,7),(2,0)\}\)
   c) \(\{-3,4\}\)
   d) \(\{(5,5),(6,1)\}\)
13. Let \( f(x) = 2x^2 - 3 \) and \( g(x) = 7x - x^2 \). Find:
   a) \( f(-2) \)  
   b) \( (f \cdot g)(a) \)  
   c) \( (f + g)(3) \)  
   d) \( \left( \frac{f}{g} \right)(x) \)  
   e) The domain of \( \frac{f}{g} \)

14. For the function \( f \) to the right, find the following (assume consecutive grid lines are one unit apart):
   a. \( f(1) \)  
   b. \( f(-1) \)  
   c. \( f(-3) \)  
   d. Which value is larger: \( f(6) \) or \( f(-2) \) ?
   
15. Graph the linear function: \( f(x) = \frac{4}{5}x - 2 \)

16. Suppose 8.2 million lb of coffee are sold when the price is $6 per pound and 10.6 million lb are sold at $5 per pound.
   a. Find a linear equation that expresses the amount of coffee sold \( y \) as a function of the price per pound \( x \).
   b. Use this equation to predict the consumer demand if the price is $9 per pound.

17. Maria's wages are $2400 plus 3.5% commission on monthly sales.
   a. Write a function expressing the relationship between Maria's wages, \( w \), and her monthly sales, \( x \).
   b. Find her sales for the month if her wages for the month are $3,380.

18. Solve the following systems of linear equations in two variables:
   a. \( \begin{cases} x - 2y &= 7 \\ 2x + 5y &= 5 \end{cases} \)  
   b. \( \begin{cases} 4x + 3y &= -1 \\ 5x - 2y &= 16 \end{cases} \)  
   c. \( \begin{cases} 2x + 7y &= 65 \\ 21y + 6x &= 19 \end{cases} \)

19. The sum of two numbers is 95. One of the numbers is 17 more than the other. What are the numbers?

20. John’s motor boat took 4 hours to make a trip downstream with 5-mph current. The return trip against the same current took 6 hr. Find the speed of the boat in still water.

21. A store sells plain sweatshirts for $19.95 each, and Coca Cola sweatshirts sell for $29.50 each. In one day it sold 120 sweatshirts for a total of $2833.30. How many of each kind were sold?
For Problems 22 - 27, solve the linear inequalities. Graph the solution and give the answer in interval notation.

22. $3(x - 5) + 2x \geq 2x + 6$

23. $-3 \leq -2(x + 0.5) < 4$

24. $3(x - 8) < 21$ and $5x + 1 > -14$

25. $2x + 3 > 19$ or $-3x + 9 \geq 30$

26. $|x| \geq 8$

27. $|x| < 5$

28. Solve the equation for $x$ and simplify, if possible: $|3x - 1| = 8$

29. Graph the solution to the inequality: $4x + 3y \geq 24$

30. Graph the solution to the systems of inequalities:
   
   a. $-4 \leq y < 3$
   
   b. \[
   \begin{cases}
   2x + y \geq 4 \\
   x \geq 0
   \end{cases}
   
   c. \[
   \begin{cases}
   x + y > 4 \\
   y \leq 2x - 4
   \end{cases}
   
For Problems 31 - 43, factor completely, if possible:

31. $x^2 - y^2$

32. $x^2 + y^2$

33. $x^3 - y^3$

34. $x^3 + y^3$

35. $x^2 - 2xy + y^2$

36. $x^2 + 2xy + y^2$

37. $2x^3y - 4x^2y - 6xy$

38. $a^2(x + 1) - 4(x + 1)$

39. $81 - y^4$

40. $x^4 - 13x^2 + 36$

41. $2x^2 + x - 6$

42. $ab^2 + cb^2 - 4a - 4c$

43. $5r^3 - 40$

For Problems 44 - 47, solve the equations for $x$ and simplify, if possible:

44. $x^2 - 12 = 4x$

45. $6x^2 = 24$

46. $10x^2 + 5x = 0$

47. $(x - 2)(x + 3) = -4$

48. Find the domain of:
   
   a. $f(x) = \frac{x - 3}{x^2 - 3x}$
   
   b. $g(x) = x^2 + x$
49. Find the three sides of this right triangle. 
   [Hint: Use the Pythagorean Theorem: \( a^2 + b^2 = c^2 \) ]

50. The width of a rectangle is 5 cm less than the length. The area is 104 square cm. Find the length and the width.

For Problems 51 - 58, perform the indicated operation and simplify (reduce), if possible:

51. \( \frac{3x^2 + 3xy}{10x - 20} \cdot \frac{5x^2 - 20}{x^2 + 2xy + y^2} \)

52. \( \frac{y + 2}{y + 3} + \frac{y^3 + 8}{3y^2 - 27} \)

53. \( \frac{x^2 - 2}{x - 3} + \frac{x + 4}{3 - x} \)

54. \( \frac{4x + 3}{x^2 + 6x + 8} + \frac{3x}{x + 2} \)

55. \( \frac{5y - 4}{4y - 3} - \frac{2y}{3y + 1} \)

56. \( 1 + \frac{1}{x} \)

57. \( \frac{y - x}{x} - \frac{1}{y} - \frac{1}{y} \)

58. \( \frac{4x}{3} - \frac{2}{5 + \frac{y}{x}} \)

For Problems 59 - 62, solve the equations for \( x \) and simplify, if possible:

59. \( \frac{6}{2x + 5} = \frac{4}{x - 9} \)

60. \( \frac{x + 2}{x^2 - 5x - 24} + \frac{4}{x - 8} = \frac{2}{x + 3} \)

61. \( \frac{x}{x + 5} - 3 = \frac{x}{x + 5} \)

62. \( x - \frac{5}{x} = \frac{23}{x} \)

63. Carl, an experienced shipping clerk, can fill a certain order in 6 hours. Tim, a new clerk, needs 8 hours to complete the same job. How long would it take for both working together to fill the order?

64. Caleb's average driving speed is 12 kilometers per hour slower than Ling's. In the same length of time it takes Caleb to drive 231 km, Ling drives 297 km. What is Caleb's average speed?
65. a. Solve for \( R \): \[ I = \frac{nE}{R + nr} \]  

b. Solve for \( r \): \[ rL = H(r + k) \]

For Problems 66 - 69, simplify.

66. \[ \left( x^6 \right)^{\frac{1}{3}} \]  

67. \[ \sqrt{75} \]  

68. \[ \sqrt[4]{36b^4} \]  

69. \[ 2\sqrt{27} - 5\sqrt{300} \]

For Problems 70 - 72, multiply and simplify. Assume all variables represent nonnegative, real numbers.

70. \[ (6 - \sqrt{3})(2 + \sqrt{3}) \]  

71. \[ \sqrt{6x}\sqrt{3y} \]  

72. \[ \frac{3\sqrt[3]{54x^5y^2}}{2\sqrt[5]{27x^{15}y^{10}}} \]

For Problems 73 - 75, evaluate:

73. \[ 8^{2/3} \]  

74. \[ 16^{-1/4} \]  

75. \[ (-64)^{-1/3} \]

76. Solve the equation for \( x \) and simplify, if possible: \[ x - 1 = \sqrt{3x + 7} \]

For Problems 77 - 79, perform the indicated operation and express the answer in \( a + bi \) form.

77. \[ \sqrt{-25}(3 - 2i) \]  

78. \[ \frac{2 + 3i}{1 - 5i} \]

79. \[ (3 - 6i) + (2 + 3i) - i^3 \]

80. Solve the equations for \( x \) and simplify, if possible:

a. \[ x^2 + 2x = 4 \]  
b. \[ 2x^2 + 16 = 0 \]

c. \[ 1 - \frac{3}{x} - \frac{7}{x^2} = 0 \]  
d. \[ 3x^2 - 6x + 5 = 0 \]
81. Graph \( f(x) = -2(x + 1)^2 + 4 \) and give:
   a. The vertex
   b. The axis of symmetry
   c. The maximum or the minimum of the function

82. For the function \( f(x) = x^2 - 6x + 4 \), find the following:
   a. The axis of symmetry
   b. The vertex
   c. The y-intercept
   d. The x-intercept(s)
   e. Graph

83. Jamal throws a ball upward from the top of a building. The distance \( d \), in feet, of the ball from the ground at any time \( t \), in seconds, can be found by the formula

\[
d = -16t^2 + 96t + 64
\]

a. Find the time the ball reaches its maximum height.
   b. Find the maximum height.

84. The weight, \( W \), of an object on Mars varies directly with the weight, \( E \), on Earth. A person who weighs 95 lb on Earth weighs 38 lb on Mars. How much would a 100-lb person weigh on Mars?

85. The intensity, \( I \), of a television signal varies inversely as the square of the distance, \( d \), from the transmitter. If the intensity is \( \frac{25}{W} \) at a distance of 2 km, how far from the transmitter are you when the intensity is \( \frac{2.56}{W} \)?

86. Graph the following functions:
   a. \( f(x) = \left(\frac{1}{4}\right)^x \)
   b. \( f(x) = 4^x \)

87. Given the points \( A(2, -3) \) and \( B(4, -2) \), find the distance from \( A \) to \( B \) and find the midpoint of the line segment joining \( A \) and \( B \).

88. Find the center and radius of each circle:
   a. \( (x + 5)^2 + (y - 3)^2 = 64 \)
   b. \( x^2 + y^2 - 16x + 4y + 5 = 0 \)
ANSWERS

1. \( \frac{35x^2}{y^5} \)

2. \( \frac{16x^4}{y^2} \)

3. \( \frac{3c^5}{4a^6} \)

4. \( m = -\frac{2}{3}, \ y\text{-int: (0, -3)} \)

5. x-int: (7.5, 0), y-int: (0, -5)

6. a. \( m = 0 \)
   a. \( -2 \)
   b. no slope (undefined)

7. \( y = -\frac{3}{4}x - 3 \)

8. \( m = 0.8, \ y\text{-int: (0,3.2)}, \ y = 0.8x + 3.2 \)

9. \( y = \frac{2}{3}x + 7 \)

10. \( y = \frac{3}{4}x - \frac{13}{2} \)

11. parallel

12. a. Function. Domain: \( \{4,5,6\} \), Range: \( \{1,2,3\} \)

   b. c: Not functions

   d. Function. Domain: \( \{x| -4 \leq x \leq 6\} \), Range: \( \{y| -2 \leq y \leq 5\} \)

13. a. 5

   b. \(-2a^4 + 14a^3 + 3a^2 - 21a\)

   c. 27

   d. \( \frac{2x^2 - 3}{7x - x^2} \)

   e. \( \{x| x \neq 0, 7\} \)

14. a. 0

   b. 3

   c. 1

   d. \( f(-2) \)

15. 

16. a. \( y = -2.4x + 22.6 \)

   b. 1 million lb.

17. a. \( w = 2400 + 0.035x \)

   b. $28000

18. a. (5, -1)

   b. (2, -3)

   c. No Solution

19. 39, 56

20. 25 mph

21. 74 plain, 46 CocaCola

22. 

23. 

24. 

25. 

26. $-8 \leq x \leq 8$ or $(-\infty, -8] \cup [8, \infty)$

27. $-5 < x < 5$ or $(-5, 5)$

28. 3 or $-7/3$

29. Not factorable: Sum of Squares

30. a. $A^2 - 4$
   b. $4 - 2$
   c. $2 - 4$

31. $(x - y)(x + y)$

32. Prime (Not Factorable): Sum of Squares

33. $(x - y)(x^2 + xy + y^2)$

34. $(x + y)(x^2 - xy + y^2)$

35. $(x - y)^2$

36. $(x + y)^2$

37. $2xy(x - 3)(x + 1)$

38. $(x + 1)(a + 2)(a - 2)$

39. $(3 - y)(3 + y)(9 + y^2)$

40. $(x + 3)(x - 3)(x + 2)(x - 2)$

41. $(2x - 3)(x + 2)$

42. $(a + c)(b + 2)(b - 2)$

43. $5(r - 2)(r^2 + 2r + 4)$

44. 6, −2

45. ± 2

46. 0, −1/2

47. −2, 1

48. a. $\{x | x \neq 0, 3\}$
   b. all real numbers

49. 6, 8, 10

50. L = 13 cm, W = 8 cm

51. \(\frac{3x(x + 2)}{2(x + y)}\)

52. \(\frac{3(y - 3)}{y^2 - 2y + 4}\)

53. $x + 2$

54. \(\frac{3x^2 + 16x + 3}{(x + 2)(x + 4)}\)

55. \(\frac{7y^2 - y - 4}{(4y - 3)(3y + 1)}\)

56. \(\frac{x + 1}{x}\)

57. $y + x$

58. \(\frac{2x(2x - 3)}{3(5x + y)}\)

59. −37

60. −10

61. No Solution (reject −5)

62. ± $2\sqrt{7}$

63. \(3 \div \frac{3}{7}\) hours

64. 42 km/h
65.  a. \[ R = \frac{nE - nrI}{I} \]  
    b. \[ r = \frac{Hk}{L - H} \]

66.  \[ x^2 \]  
67.  \[ 5\sqrt{3} \]  
68.  \[ 6b^2 \]  
69.  \[ -44\sqrt{3} \]

70.  \[ 9 + 4\sqrt{3} \]  
71.  \[ 3\sqrt{2xy} \]  
72.  \[ 9x^6 y^4 \frac{3\sqrt{2x^2}}{} \]

73.  \[ 4 \]  
74.  \[ 1/2 \]  
75.  \[ -1/4 \]

76.  6 (reject \(-1\))  
77.  \[ 10 + 15i \]

78.  \[ \frac{-1 + 1}{2}i \]  
79.  \[ 5 - 2i \]

80.  a. \[ -1 \pm \sqrt{5} \]  
    b. \[ \pm 2i\sqrt{2} \]  
    c. \[ (3 \pm 3\sqrt{7})/2 \]  
    d. \[ (3 \pm i\sqrt{6})/3 \]

81.  a. \((-1, 4)\)  
b. \[ x = -1 \]
    c. \[ \text{Max} = 4 \]

82.  \[ \text{Axis: } x = 3 \]
    \[ \text{Vertex: } (3, -5) \]
    \[ \text{y-int: } (0, 4) \]
    \[ \text{x-int: } (3 + 3\sqrt{5}, 0) \text{ and } (3 - 3\sqrt{5}, 0) \]

83.  a. 3 seconds  
    b. 208 ft

84.  40 lb  
85.  6.25 km

86.  a.  
    b.  

87.  \[ d = \sqrt{5} \]  
    \[ \text{midpoint is } (3, -\frac{5}{2}) \]

88.  a. \(C(-5,3), \ r = 8\)  
    b. \(C(8,-2), \ r = 3\sqrt{7}\)