Algebra Review

1. Write an equation in slope-intercept form of the graph.

2. Write an equation for the function in slope intercept form.
   \[ f(-4) = 22, \quad f(0) = -2 \]

3. Write an equation of the line containing the points \((-6, 19)\) and \((-15, 28)\).

4. Which is the equation for the linear function \(f\) in the form \(f(x) = mx + b\) that has the given values? \(f(1) = 2, \quad f(6) = 17\)
   a. \(f(x) = 3x - 1\)
   b. \(f(x) = -3x - 1\)
   c. \(f(x) = -3x + 1\)
   d. \(f(x) = 3x + 1\)

5. Write an equation in point-slope form of the line that passes through the points \((-5, -4)\) and \((6, 3)\).

6. What is the missing number in the sequence?
   \[ \frac{1}{5}, \frac{2}{3}, \frac{4}{5}, \ldots, \frac{7}{5}, \ldots \]

7. An editor gets a $2110 raise each year. After working eight years, she is making $70,100 per year. Write an equation in point-slope form which models her income in terms of how many years she has worked at the company.

8. Graph the equation.
   \[ y - \frac{3}{2} = 4 \left( x + \frac{3}{4} \right) \]
9. The table shows the cost of having a pizza party at a local restaurant.

<table>
<thead>
<tr>
<th>Number of people</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost (dollars)</td>
<td>16</td>
<td>28</td>
<td>40</td>
<td>52</td>
<td>64</td>
</tr>
</tbody>
</table>

a. Find the rate of change for consecutive data pairs in the table.
b. Can the data be modeled by a linear equation? Justify your answer.
c. Write an equation that gives the cost as a function of the number of people.
d. Use the equation to find the cost for 7 people.

10. Write the equation of the line passing through (2, –7), (2, 0), and (2, 5).

11. Write the equation of the horizontal line passing through the point (4, 7).

12. Find the y-intercept of the line containing the point (–1, 4) with undefined slope.

13. Write the equation of the horizontal line that passes through the point (7, –3).

14. Good Woods, Inc. is having a furniture sale. All dining room tables are on sale for $300 each and all chairs are on sale for $50 each. Assume there is no sales tax. A customer has $600 to spend at the sale. Graph the possible numbers of tables and chairs the customer can buy.

15. Write two equations in standard form that are equivalent to the given equation.
   \[60x - 20y = 48\]

16. Write an equation of the line that passes through \((-5, -1)\) and is parallel to the line \(y = 4x - 6\).

17. Write an equation of the line that goes through the point \((3, 7)\) and is perpendicular to the line \(y = -3x + 6\).
18. Which of the following lines is NOT parallel to the line shown in the graph?

![Graph Image]

a. $3x + y = 3$

b. $y - 3x = 9$

c. $-12x + 4y = 9$

d. $3x - y = 3$

19. Which of the following lines are parallel to each other?

$2x - 6y = 3$; $6x + 2y = 3$; $-2x + 6y = 3$

20. Tell whether $x$ and $y$ show a positive correlation, negative correlation, or relatively no correlation.

![Scatter Plot Image]

21. This year the Alaska High basketball team scored the following number of points in its 10 games.

<table>
<thead>
<tr>
<th>Game</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points</td>
<td>72</td>
<td>73</td>
<td>83</td>
<td>84</td>
<td>78</td>
<td>85</td>
<td>84</td>
<td>93</td>
<td>85</td>
<td>93</td>
</tr>
</tbody>
</table>

a. Make a scatter plot of the ten data points. Let $x =$ the game number and $y =$ the number of points scored during the game.

b. Find a line of fit. Graph the line on the scatter plot in part (a). Label the line.

22. Describe a scatter plot, and explain the difference between positive and negative correlation.
23. Bianca is making home-made cards to send to friends and family and to sell at the local craft fair. This scatter plot shows the total number of cards she had made after each hour she worked on the task.

![Scatter plot showing the number of cards made over time.]

Using this information, what is the best prediction of the number of cards Bianca can make in 12 hours?

24.

<table>
<thead>
<tr>
<th>x</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>0.2</td>
<td>2.3</td>
<td>3.9</td>
<td>7.5</td>
<td>9.8</td>
</tr>
</tbody>
</table>

Use the equation of the best-fitting line to approximate the value of $y$ for $x = 3$ in the table above.

25. The table shows the lengths (in inches) of winning zucchini lengths at a state fair during the period 1986-1995.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (in.)</td>
<td>32.4</td>
<td>32.6</td>
<td>29.9</td>
<td>33.2</td>
<td>34.0</td>
<td>34.3</td>
<td>35.2</td>
<td>36.9</td>
<td>34.4</td>
<td>35.3</td>
</tr>
</tbody>
</table>

a. Make a scatter plot of the data. Let $x$ represent the number of years after 1985 and $y$ represent the winning length that year.

b. Use technology to perform a linear regression. What is the equation of the linear regression model? Graph the equation on the scatter plot for part (a).

c. Predict the winning length for the year 2000.

26. Solve $-12y < -60$

27. Solve $\frac{1}{7}x \geq \frac{3}{14}$
28. Solve. \(-7(4x - 3) \leq -7\)

29. Maria is the hostess and manager at a restaurant. She receives a yearly salary of $18,500, plus 4% of each day's receipts at the restaurant. Last year Maria's total pay was more than $36,000. Write and solve an inequality to find the least possible value for the restaurant's receipts last year.

30. On a road in the city of Rochester, the maximum speed is 50 miles per hour and the minimum speed is 20 miles per hour. If \(x\) represents speed, which sentence best expresses this condition?
   a. \(50 \geq x - 20\)
   b. \(50 \geq x \leq 20\)
   c. \(50 \geq x \geq 20\)
   d. \(50 \leq x \leq 20\)

31. Your veterinarian tells you that a healthy weight for your dog is between 70 and 80 pounds. Write an inequality to represent your dog's healthy weight \(w\) in kilograms.
   a. \(w \leq 36.4\)
   b. \(154 \leq w \leq 176\)
   c. \(31.8 \leq w \leq 36.4\)
   d. \(w \geq 154\)

32. Solve. \(5 = |-4 + 5x|\)

33. Solve. \(|-3x - 7| + 4 < 3\)

34. Graph the following inequality.
   \[x \leq -7\]

35. Graph the inequality.
   \[3x - 2y > -14\]

36. A wholesaler has $75,000 to spend on certain models of TV sets and VCRs. If the TV sets may be obtained at $375 each and the VCRs at $215 each, write an inequality that describes the possible numbers of TVs and VCRs the wholesaler can purchase.
37. Solve the linear system by graphing.
\[ x + y = 1 \]
\[ 3x - y = -5 \]

38. Susanna is packaging a blend of mixed nuts and candies for wedding favors. The mixed nuts cost her $3 per pound and the candies cost her $4 per pound. Susanna spends $27 altogether for the nuts and candies and bought a total of 8 lb of nuts and candies. Solve the system of equations to find how many pounds of nuts and how many pounds of candies Susanna bought.

39. A chemistry teacher needs 2.5 liters of a sulfuric acid solution that is 20% sulfuric acid and 80% water. He has 2 liters of a 15% sulfuric acid solution left over from earlier laboratory exercises. He also has 4 liters of a 50% solution. Let \( x \) represent the number of liters of the 15% solution that can be mixed with \( y \) liters of the 50% solution to make 2.5 liters of the needed 20% solution. Write a system of equations that could be solved to find the amounts of the 15% and 50% solutions that could be mixed to get the required solution.

40. Use substitution to solve the linear system.
\[ x + 4y = -1 \]
\[ 2x - y = 7 \]

41. A rental car agency charges $15 per day plus 11 cents per mile to rent a certain car. Another agency charges $18 per day plus 8 cents per mile to rent the same car. How many miles will have to be driven for the cost of a car from the first agency to equal the cost of a car from the second agency? Express the problems as a system of linear equations and solve using the method of your choice.

42. The length of a rectangle is 7 cm more than four times the width. If the perimeter of the rectangle is 44 cm, what are its dimensions?

43. The sum of the ages of Petra and her mother is 53. Her mother is 11 years more than twice as old as Petra. How old are Petra and her mother?

44. The Modern Grocery has cashews that sell for $4.00 a pound and peanuts that sell for $2.50 a pound. How much of each must Albert, the grocer, mix to get 60 pounds of mixture that he can sell for $3.00 per pound? Express the problem as a system of linear equations and solve using the method of your choice.
45. Use elimination to solve the linear system.
   \[ 4x + 3y = -2 \]
   \[ 3x + 2y = -3 \]

46. Describe the solution(s) of the system.
   \[ 6x + 4y = 10 \]
   \[ 18x + 12y = -20 \]

47. Express each equation in slope-intercept form. Then determine, without solving the system, whether the
   system of equations has exactly one solution, no solution, or an infinite number of solutions.
   \[ 15x + 5y = 5 \]
   \[ -6x - 2y = -2 \]

48. Graph the solution set of the system of inequalities:
   \[ 5x + 3y \geq 15, \]
   \[ x \geq y, \]
   \[ x \leq 6 \]

49. Write a system of linear inequalities that defines the shaded region.

50. Simplify. \( r^4 \cdot r^5 \cdot r^6 \)
   a. \( r^{120} \)
   b. \( 3r^{120} \)
   c. \( r^{15} \)
   d. \( 3r^{15} \)

51. Simplify. \( (-3c^6)(2c^6d^8) \)
   a. \( -6c^{14}d^8 \)
   b. \( -6c^{48}d^8 \)
   c. \( 6c^{48}d^{14} \)
   d. \( 6c^{14}d^{14} \)

52. Simplify. \( (2qr^5)^3(qr)^6 \)
   a. \( 2q^9r^{21} \)
   b. \( 2q^4r^{21} \)
   c. \( 8q^9r^{11} \)
   d. \( 8q^9r^{21} \)
53. Simplify the following expressions. \( \left( \frac{x^4}{y^8} \right)^4 \)

a. \( \frac{x^{12}}{y^{32}} \)

b. \( \frac{x^7}{y^{12}} \)

c. \( x^{12} + y^{32} \)

d. \( \frac{x^{12}}{y^8} \)

54. Rewrite using only positive exponents: \( 3a^2b^{-2}c^{-3} \)

55. Rewrite the expression using positive exponents. \( \frac{1}{9x^{-2}y^{-1}} \)

56. Write 0.000732 in scientific notation.

a. \( 732 \times 10^{-6} \)

b. \( 732 \times 10^{-5} \)

c. \( 0.732 \times 10^{-3} \)

d. \( 7.32 \times 10^{-4} \)

57. Find the product. \( \left( 3.5 \times 10^{-8} \right) \left( 8.2 \times 10^3 \right) \)

a. \( 28.7 \times 10^{-6} \)

b. \( 11.7 \times 10^{-6} \)

c. \( 2.87 \times 10^{-6} \)

d. \( 28.7 \times 10^{-16} \)

58. In astronomy, the immense distances between celestial bodies are measured in light-years, the distance that light can travel in one year. One light-year is approximately 5,880,000,000,000 miles. If a star is 8.4 light-years from Earth, how would you correctly represent the number of miles the star is from Earth in scientific notation?

a. \( 49.4 \times 10^{12} \)

b. \( 4.8 \times 10^{13} \)

c. \( 4.9 \times 10^{13} \)

d. \( 5.9 \times 10^{12} \)

59. Rewrite 50,800,000 in scientific notation.

60. If there are initially 3500 bacteria in a culture, and the number of bacteria double each hour, the number of bacteria after \( t \) hours can be found using the formula \( N = 3500 \left( 2^t \right) \). How long will it take the culture to grow to 35,000 bacteria?

61. Find the value of $1000 deposited for 8 years in an account paying 8% annual interest compounded semiannually.

62. Write a rule for a function.

<table>
<thead>
<tr>
<th>( x )</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>147</td>
<td>21</td>
<td>3</td>
<td>7</td>
<td>49</td>
</tr>
</tbody>
</table>

63. Write an exponential function to model the situation.

A population of 470 animals decreases at an annual rate of 12%.
64. Graph the function and label as exponential growth or exponential decay.

\[ y = 4 \left( \frac{7}{2} \right)^x \]

65. The enrollment at Alpha-Beta School District has been declining 3% each year from 1994 to 2000. If the enrollment in 1994 was 2583, find the 2000 enrollment.

66. Tell whether the graph represents exponential growth or exponential decay. Then write a rule for the function.

67. Simplify. \( \left( 5q^5 + 4 \right) - \left( 2q^3 + 9 \right) + \left( 6q^5 - q^3 \right) \)

68. Find the product. \( \left( 6y^2 + 3y + 2 \right)(y-7) \)

69. Find the product. \( \left( 5x^2 - 5 \right)^2 \)

70. \((2v + 5)(2v - 5)\)

71. \( \left( 4x + 7y \right)^2 \)

72. Factor out the greatest common monomial factor from \( 18t^4v^5 + 30t^5v^4 \).

73. Solve the equation \( 3x - 7x^2 = 0 \).

74. The equation \( h = -16t^2 + 56t \) models the height \( h \), in feet, of a golf ball \( t \) seconds after it was hit. Find the values of \( t \) for which \( h = 0 \). Explain the meaning of the solutions.
75. Factor. \( x^2 - 16x + 63 \)

76. Solve the equation \( 30x^2 + 11x - 30 = 0 \).

77. Factor. \( 33x^2 - 79x + 40 \)

78. \(-6x^2 + 19x - 10\)

79. Solve. \( 100g^2 + 240g + 144 = 0 \)

80. Factor the polynomial \( 36t^2 - 16 \)

81. \( 121x^2 - 44xy + 4y^2 \)

82. \( \frac{1}{2} s^2 - st - \frac{1}{2} t^2 \)

83. Solve. \( 2x^7 - 10x^5 + 5x^3 - 25x \)

84. Sketch the graph of the equation \( y = -\frac{5}{7}x^2 \).

85. Graph and determine the solutions.

\[
y = 2x^2 - 2x + 1
\]

86. The equation \( h = -16t^2 + 40t + 5 \) gives the height \( h \), in feet, of a baseball as a function of time \( t \), in seconds, after it is hit. What is the maximum height the baseball reaches?

87. Solve the equation by completing the square.

\[
r^2 - 4r - 7 = 0
\]

88. Use the quadratic formula to solve the equation. \( x^2 = 15x - 34 \)
89. Use the quadratic formula to solve the equation. Round your solution to the nearest hundredth, if necessary.

\[ 3x^2 - x - 3 = 0 \]

Tell whether the table of values represents a linear function, an exponential function, or a quadratic function. Then write an equation for the function.

90. Tell whether the table of values represents a linear function, an exponential function, or a quadratic function. Then write an equation for the function.

<table>
<thead>
<tr>
<th>x</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>$\frac{4}{9}$</td>
<td>$\frac{4}{3}$</td>
<td>4</td>
<td>12</td>
<td>36</td>
</tr>
</tbody>
</table>

91.

<table>
<thead>
<tr>
<th>x</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>-13</td>
<td>-6</td>
<td>-1</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

92. Graph the function \( y = \sqrt{x - 3} + 2 \).

93. Simplify \( \sqrt{150} \)

94. \( \sqrt{30} \cdot \sqrt{12} \)

95. \( 2\sqrt{6} - \sqrt{81} - 4\sqrt{24} \)

96. Find the quotient and completely simplify the radical: \( \frac{\sqrt{320}}{\sqrt{8}} \)

97. Perform the indicated operations and simplify the result.

\( \left( \sqrt{2} + \sqrt{3} \right) \sqrt{6} \)

98. Find the product \( \left( 2x - \sqrt{3} \right) \left( 2x + \sqrt{3} \right) \).
99. Simplify \(\sqrt{xy^3} \cdot \sqrt{x^3y}\)

100. Solve the equation, if possible.
\[\sqrt{2-x} = 2-x\]

101. \(x\) and \(y\) vary inversely. If \(x = \frac{5}{2}\) when \(y = 50\), find an equation relating \(x\) and \(y\).

102. The price per person of renting a bus varies inversely with the number of people renting the bus. It costs $20 per person if 27 people rent the bus. How much will it cost per person if 95 people rent the bus?

103. Use the chart below, which gives the length \(l\) and width \(w\) of a rectangle having an area of 24 square units.

<table>
<thead>
<tr>
<th>(l)</th>
<th>6</th>
<th>3</th>
<th>2</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(w)</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>48</td>
</tr>
</tbody>
</table>

a. Does \(l\) vary inversely with \(w\)? If so, write an equation giving \(w\) as a function of \(l\).

b. Find the length of a rectangle that has width 0.25.

104. Sketch the graph of \(y = \frac{1}{3x} + 5\). Identify any asymptotes.

105. Graph the function. \(y = \frac{6}{x-3} - 4\)

106. Divide. \(\frac{5x^2 - 10x + 4}{-5x}\)

107. \(\frac{2x^2 - x + 1}{x + 4}\)

108. Divide \(24x^2 - 9x^3 + 12 - 27x\) by \(3x - 5\).
109. Sketch a graph of \( f(x) = \frac{3x+2}{x+2} \). Include any vertical or horizontal asymptotes.

110. Determine the value or values of the variable where the expression is not defined. \( \frac{x-7}{x^2-6x-16} \)

111. Simplify the expression \( \frac{x^2+4x}{x^2-16} \).

112. Simplify \( \frac{x^2+4x-21}{3+5x-2x^2} \). State the excluded values.

113. \( \frac{13x^5}{12x^3} \cdot \frac{6x^2}{4x^6} \)

114. \( \frac{x^2+2x+1}{4x^2+4x} \div \frac{x^2-1}{8x} \)

115. \( \frac{5}{x+3} - \frac{9}{x-3} \)

116. \( \frac{x^2-1}{x^2+8x+7} - \frac{1}{x+7} \)