1.1 Assignment – Writing Linear Equations

Using the information provided to answer each question.

1. Given a slope of $-\frac{2}{5}$ and the point $(10, 4)$, write a linear equation in slope-intercept form.

2. Given the points $(5, 2)$ and $(-8, 2)$, write a linear equation.

3. What are the axes intercepts for the line with the equation $4x - 2y = 6$?
   - $x$-intercept: 
   - $y$-intercept: 

4. Write the equation of a line that crosses the $x$-axis at $-1$ and crosses the $y$-axis at $-5$.
   - Point-Slope Form: 
   - Slope-Intercept Form: 

5. Write the equation of a line with an undefined slope that crosses through the point $(-2, 4)$

**CRITICAL THINKING:**

6. Explain why the slope of a vertical line is undefined. (HINT: You can use two ordered pairs and the slope formula)
7. A boat trip of 40 miles costs $405. A 100 mile trip costs $825.
   a) Write a linear equation in slope-intercept form that represents the cost, \( C \), in terms of the distance of a trip, \( d \).

   \[ C = \text{some expression in terms of } d \]

   b) Use your equation to predict the cost of traveling 75 miles.

   \[ C = \text{some calculation} \]

   c) Use your equation to predict the length of trip you can take if you have $775.

   \[ d = \text{some calculation} \]

   Round all non-integral answers to the nearest mile.

8. A plane is descending in order to land. After 5 minutes, it’s elevation is 6500 feet above sea level. Its elevation is 5900 feet after 7 minutes.
   a) Write an equation in slope-intercept form that represents the elevation of the plane, \( E \), in terms of time, \( t \).

   \[ E = \text{some expression in terms of } t \]

   b) Explain the point \((9, 5300)\) in terms of this situation.

   \[ \text{Explanation} \]

   c) Why is the slope negative?

   \[ \text{Reason} \]

   d) What is the \( x \)-intercept and what does it represent in this situation?

   \[ \text{Intercept} \]
1.2 Assignment – Parallel & Perpendicular Lines

1. Given the equation $3x - y = 4$:
   a. Find the equation of a line parallel to the given line that crosses the $x$-axis at $-2$, in slope-intercept form.

   b. Find the equation of a line perpendicular to the given line that passes through the point $(-6, 3)$, in point-slope form.

   c. Graph the lines from problem 1a on the grid below.

   d. Graph the lines from problem 1b on the grid below.

2. Given the points $(3, 5)$ and $(-3, 1)$:
   a. Graph a line parallel to the given points and has a $y$-intercept of $-5$

   b. Graph a line perpendicular to the given points and has a $y$-intercept of $-1$. 
3. If the line through \((-2, 4)\) and \((5, d)\) is parallel to the graph of \(3x - y = -4\), what is the value of \(d\)? _________

4. Graph the points \(X (-2, -4), Y (-2, 1)\), and \(Z (3, 3)\) on the grid below.

   ![Graph](image)

   a. Determine the coordinates of a fourth point that would form a parallelogram. _________

   b. Explain your reasoning. _______________________________________________________________  
   ______________________________________________________________________________________

5. Lines \(A, B, C\), and \(D\) all pass through the point \((3, 6)\). Line \(A\) also passes through \((7, 12)\), line \(B\) passes through \((8, 4)\), line \(C\) passes through \((1, 3)\), and line \(D\) passes through \((1, 1)\).

   a. Are any of these lines perpendicular? If so, which ones? If not, why not?
   __________________________________________________________
   __________________________________________________________

   Work:

   b. Are any of these lines parallel? If so, which ones? If not, why not?
   __________________________________________________________
   __________________________________________________________

   Work:
1.3 Assignment – Solving Systems of Equations Graphically

1. Given the equation $2x - y = 5$:
   a) Write an equation in slope-intercept form that is perpendicular and passes through the point $(-1, 3)$.

   b) If these two equations make up a system, find the solution graphically.

   For problems 2 & 3, find the solutions to the systems of equations. Verify your answers algebraically. (Plug the $x$-value into the $x$ of the equations and the $y$-value into the $y$ of the equations and check to see that you get true statements. Check BOTH equations.)

2. $2x + y = 4$  Solution: _______
   $x - y = 2$

3. $-6x + y = -5$  Solution: _______
   $-2x + y = -1$
Use the graphing calculator to determine the solutions to the following systems of equations.

4. \(-3x + 5y = 9\) \quad \text{Solution: _______} \quad 5. \(2x - 4y = 8\) \quad \text{Solution: _______}
\(x - 7y = 12\) \quad \(x - 2y = -8\)


a) Identify the variables: \(x = \) \phantom{____} \quad y = \phantom{____}

b) Write the equations: Sue: \phantom{____} \quad Jada: \phantom{____}

c) Solve the system of equations graphically:

Work: \quad \text{Solution: \phantom{____}}

7. Farm Fresh sells cartons of two kinds of frozen yogurt. The Blueberry Frozen Yogurt sells for $4 per carton and the Strawberry Frozen Yogurt sells for $7 per carton. If 12 cartons of frozen yogurt were sold for a total of $72, how many of each type of yogurt were sold?

a) Identify the variables: \(x = \) \phantom{____} \quad y = \phantom{____}

b) Write the equations: \phantom{____} \quad \phantom{____}

c) Solve the system of equations graphically:

Work: \quad \text{Solution: \phantom{____}}
1.4 Assignment – Solving Systems of Equations Algebraically

*Find the solutions algebraically.*

1. Use elimination: \(2x - y = 2\) \(\quad\) Solution: _____
   \(x - 2y = 4\)

2. Use elimination: \(3x + y = 5\) \(\quad\) Solution: _____
   \(-x + 2y = -4\)

3. Use substitution: \(2x - 3y = 12\) \(\quad\) Solution: _____
   \(x - y = 1\)

4. Use substitution: \(y = 5x + 1\) \(\quad\) Solution: _____
   \(4x + y = 10\)
5. My dog walker charges $2.50 per hour plus a flat fee of $10. Maria’s dog walker charges $3.00 per hour plus a flat fee of $7.50. Determine, algebraically, the number of hours when the total cost is the same and give the cost.

\[
\text{Number of hours: } \quad \text{Cost: } \quad \]

6. The senior class is selling jar candles. Large jars sell for $7 and medium jars sell for $5. You sold 4 more medium jars than large jars, and your total sales amounted to $152. Determine, algebraically, the number of each size sold.

\[
\text{Large Jars: } \quad \text{Medium Jars: } \quad \]

Factor completely.

1. \(x^2 - 4x - 45\)  
2. \(3x^2 - 21x + 18\)  
3. \(25x^2 - 100\)  

4. \(6x^2 - 12x\)  
5. \(-2x^2 + 10\)  
6. \(9a^2 - 49b^2\)
1.5 Assignment – Solving Systems of Equations with Matrices

*Solve the following systems of equations graphically. Use the TI-84 PLUS to find the solution.*

1. \( x - y = -2 \)  
   \(-x + y = 2\)  
   Solution: _______  

2. \( y = -3 \)  
   \( x - y = 3 \)  
   Solution: _______

*Solve the following systems of equations algebraically.*

3. Use substitution:  
   \( 2x - 3y = 12 \)  
   \( y = x - 1 \)  
   Solution: _______

4. Use elimination:  
   \( 6x - 2y = 10 \)  
   \( 3x - 7y = -19 \)  
   Solution: _______

5. Use elimination:  
   \( 4x + 2y = -14 \)  
   \( 5x + 3y = -17 \)  
   Solution: _______

6. Use substitution:  
   \( 3x + 4y = -3 \)  
   \( x + 2y = -1 \)  
   Solution: _______
Solve the following systems of equations using matrices.

7. \[4x = 10 - y\]
   \[3x + 5y = -1\]

8. \[3x + 2y - z = 14\]
   \[4z - 5y = x - 48\]
   \[4x + y + z = 2\]

9. Write the equation of a line perpendicular to the equation \[2x + 3y = 12\] and passing through the point \((-4,6)\):
   a) Point-Slope: _____________________
   b) Slope-Intercept: _____________________

Work:

10. Given the points \((-3,3)\) and \((3,1)\), write the equation of the line in:
   a) Point-Slope: _____________________
   b) Slope-Intercept: _____________________

Work:

11. You have \$9000\ to invest in three Internet companies listed on the stock market. You expect the annual returns for companies A, B, and C to be 10\%, 9\%, and 6\% respectively. You want the combined investment in companies B and C to be twice that of company A. How much should you invest in each company to obtain an average return of 8\%?
SOLVING LINEAR APPLICATIONS

For each question:
   a) Define your variables
   b) Write your equations
   c) Choose a method to solve (substitution, elimination, graphically, or using matrices)
   d) Write your solution using complete sentences explaining the values based on the situation

1. Kate bought 5 pounds of hamburger and 2 pounds of hotdogs and paid $28.50. Eric bought half the amount of hamburger and a quarter of the amount of hotdogs that Kate did and paid $12.50. Find the cost per pound of hamburgers and hotdogs.

2. An alloy containing 65% aluminum is made by melting together two alloys that are 25% aluminum and 75% aluminum. How many kilograms of each alloy must be used to produce 160 kilograms of the 65% alloy?
3. Jack has 63 pennies, dimes, and quarters worth $6.30. If the number of dimes is three less than the number of quarters, how many of each coin does he have?

4. Kai invested $25,000, some in a savings account and the rest in bonds. If the return on his savings account was 4% last year and the return on his bonds was 6%, how did Kai divide his investments if the total interest was $1300?

5. A bicycle, three tricycles, and a unicycle cost $561. Seven bicycles and a tricycle cost $906. Five unicycles, two bicycles and seven tricycles cost $1758. What is the cost of each cycle?
UNIT 1 THINKING PIECE
Round all answers to one (1) decimal place

The table below shows the amount spent (in millions of dollars) each year on basketball shoes. In the table, \( t = 0 \) corresponds to the year 2008.

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>9</td>
<td>8</td>
<td>10</td>
<td>13</td>
<td>15</td>
<td>18</td>
<td>16</td>
<td>22</td>
<td>25</td>
</tr>
</tbody>
</table>

1. On graph paper:
   a) plot the points
   b) label (in words) the \( x \)-axis and \( y \)-axis
   c) indicate the scale used on both axes
   d) draw the Line of Best Fit

2. Choose any two points on your Line of Best Fit and write the equation of the line in both Point-Slope form and Slope-Intercept form (convert the fractions in slope-intercept form to decimals).
   \( \text{Work:} \)
   \[
   \text{Point-Slope form}
   \]
   \[
   \text{Slope-Intercept form}
   \]

3. Use a graphing calculator to find the Line of Best Fit.
   \[
   \text{calculator-generated line of best fit}
   \]

4. Fully explain the similarities and differences between your equation and the calculator-generated equation.

5. Using a different color, draw the calculator-generated Line of Best of Fit on your scatterplot.

   For the remainder of this assignment, use the calculator-generated Line of Best Fit to answer all of the questions.

6. Write and give the meaning of the slope in this situation.
7. a) Identify the $y$-intercept and write it as an ordered pair.
   b) Mark the $y$-intercept on your graph with an ordered pair.
   c) Give the meaning of the $y$-intercept in this situation.

8. a) Algebraically, find the $x$-intercept and write it as an ordered pair (let $y = 0$).
   
   Work:

   b) Give the meaning of the $x$-intercept in this situation.

9. a) Algebraically, find $y$ when $x = 3$ and write it as an ordered pair.
   
   Work:

   b) Mark this point on your graph and label with its ordered pair.
   c) Give the meaning of this point in this situation.

10. a) Use only the **GRAPH** of the calculator-generated Line of Best Fit to predict sales in the year 2018.

    predicted sales

   b) Use only the calculator-generated **EQUATION** of the line of Best Fit to predict sales in the year 2018.

    predicted sales

   c) Fully discuss the differences, if there are any.

   d) Use only the calculator-generated **EQUATION** of the Line of Best Fit to predict sales in the year 2040.

    predicted sales

   Is this a valid prediction? Fully explain your answer.
Algebra 3 – Unit 1 Test Review

Given the following information, write each equation in point-slope and slope-intercept form.

1. \( m = -3 \) and the point \((3, 1)\)
   a) Point-slope form: _____________________
   b) Slope-intercept form: _____________________
   Work:

2. The points \((-4, -2)\) and \((-5, -6)\)
   a) Point-slope form: _____________________
   b) Slope-intercept form: _____________________
   Work:

3. Parallel to the line \(3x + 4y = 16\) and passes through the point \((-2, 3)\)
   a) Point-slope form: _____________________
   b) Slope-intercept form: _____________________
   Work:

4. Perpendicular to the line \(x - 3y = -18\) and passes through the point \((-4, 5)\)
   a) Point-slope form: _____________________
   b) Slope-intercept form: _____________________
   Work:

5. Scientists excavating a dinosaur mapped the site on a coordinate plane. If one bone lies from \((-5, 8)\) to \((10, -1)\) and a second bone lies from \((-10, -3)\) to \((-5, -6)\), are the bones parallel?
   Work:
Solve each system of equations using the requested method.

6. Graphically: \(2x - 3y = 18\)  
   \(4x + y = 8\)

7. Elimination: \(3x - 6y = 9\)  
   \(-4x + 7y = -16\)

8. Substitution: \(x - 2y = 4\)  
   \(3x + 2y = 20\)

9. Matrices: \(4x + 5y + 3z = 15\)  
   \(x + 2z = 3y - 6\)  
   \(-x + 2y - z = 3\)

10. Jaime bought a car in 2005 for $28,500. By 2008, the car was worth $23,700. Based on a linear model, answer the following questions. (Let \(x = 0\) represent the year 2005.)

a) Find the slope: _______

b) What does the slope mean in this situation?

Work:

c) Write the equation of the line in point-slope form: _______________

d) slope-intercept form: ____________

Work:

e) Use your equation to determine the worth of the car in 2015.

f) In what year will the car be worth $4500?
11. A chemist wants to use three different solutions to create a 50-liter mixture containing 32% acid. The first solution contains 10% acid, the second 30%, and the third 50%. He needs to use twice as much of the 50% solution as the 30% solution. How many liters of each solution should be used?

_You must identify your variables and equations for credit._

12. At a pizza shop, two small pizzas, a liter of soda, and a salad cost $14; one small pizza, a liter of soda, and three salads cost $15; and three small pizzas and a liter of soda cost $16. What is the cost of one small pizza? of one liter of soda? of one salad?

_You must identify your variables and equations for credit._

13. A florist must make 5 identical bridesmaid bouquets for a wedding. She has a budget of $160 and wants 12 flowers for each bouquet. Roses cost $2.50 each, lilies cost $4.00 each, and irises cost $2.00 each. She wants twice as many roses as the other two types of flowers combined. How many of each type of flower should be in each bouquet?

_You must identify your variables and equations for credit._
2.1 Assignment – Solving Quadratic Equations (Factoring & Formula)

Solve by factoring completely.

1. \( x^2 + 6x = 27 \)  
2. \( y = 2x^2 + 10x \)  

3. \( x^2 - 1 = 0 \)  
4. \( f(x) = x^2 + 18x + 81 \)  

5. \( 3x^2 + 21x = -30 \)  
6. \( 5x^2 - 13x + 6 = 0 \)
Find the discriminant to determine the number and nature of the roots. If there are real roots, use the quadratic formula to solve.

7. \[4x^2 - 5x = -3\]  

8. \[2x^2 + 11x + 15 = 0\]

9. \[y = 9x^2 - 30x + 25\]

10. \[2x^2 - 6x = -3\]

11. The Demon Drop at Cedar Point in Ohio takes riders to the top of a tower and drops them 60 feet. A function that approximates this ride is \[h = -8t^2 - 16t + 64\], where \(h\) is the height in feet and \(t\) is the time in seconds. About how many seconds does it take for riders to drop from 60 feet to 0 feet?
2.2 Assignment – Solving Quadratic Equations by Completing the Square & Square Root Method

Solve the following quadratic equations by using the square root method. Exact answers only. NO DECIMALS.

1. \(7(x - 4)^2 - 18 = 10\) 
2. \(4(x - 1)^2 - 8 = y\) 
3. \(\frac{x^2}{25} - 6 = -2\)

Solve by completing the square. Exact answers only. NO DECIMALS.

4. \(0 = x^2 - 10x + 8\) 
5. \(f(x) = x^2 + 3x - 14\) 
6. \(2x^2 + 7x = -6\)

Solve the quadratic equation using the requested method.

7. Factoring: 
   \(y = 9x^2 - 13x - 10\)

8. Quadratic Formula: 
   \(6x^2 - 5x = 3\)
9. Michael hit a pitch that was 3.5 feet high. The ball traveled towards the outfield along a nearly parabolic path. Let \( x \) be the distance along the ground (in feet) of the ball from home plate, and let \( h(x) \) be the height (in feet) of the ball at that distance. This can be expressed by the function

\[
h(x) = -.005x^2 + 2x + 3.5
\]

Sketch the situation. Use the quadratic formula to determine the distance of the ball at a height of 8 feet.

Work:

10. The width of a high school soccer field is 45 yard shorter than its length.

a) Define the variables and write an expression for the area of the field.

b) The area of the field is 9000 square yards. Find the dimensions.

Work:
2.4 Assignment – Solving Equations with Radicals or Rational Exponents

Solve the following equations. Show ALL work for full credit.

1. \( \sqrt{2x} + 1 = 9 \)
2. \( 3 + \sqrt[3]{x} + 2 = 1 \)
3. \( 4 \sqrt[5]{-x} = -20 \)

4. \( \sqrt[3]{(2x + 1)^2} + 19 = 23 \)
5. \( 2(6x - 3)^{\frac{1}{3}} - 4 = 0 \)
6. \( (x - 5)^{\frac{3}{5}} + 1 = 2 \)
Solve the following equations using the given method.

7. Quadratic Formula: \(10x^2 + 13x = -3\)  

Exact: \______________\ Approximate: \______________\ 

8. Factoring: \(15x^2 + 1 = 8x\)

9. Square Root Method: \(y = 2(x + 3)^2 - 8\)

10. Completing the Square: \(y = 2x^2 + 24x + 8\)

11. Competitors in the 10-meter platform diving competition jump upward and outward before diving into the pool below. The height \(h\) of a diver in meters above the pool after \(t\) seconds can be approximated by the equation:

\[ h = -4.9t^2 + 3t + 10 \]

Sketch the situation. When will the diver hit the water?
2.5 Assignment – Solving Rational Equations

Solve completely for the given variable, showing all work for full credit. Indicate any extraneous solutions.

1. \( \frac{3x}{5} + \frac{3}{2} = \frac{7x}{10} \)

2. \( \frac{x-1}{x+1} - \frac{2x}{x-1} = -1 \)

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

4. \( \frac{5}{x} + \frac{7}{4} = \frac{-9}{x} \)

5. \( \frac{6x}{x-1} - 4 = \frac{5}{x-1} \)
6. The population of deer in the mountains is modeled by the function

\[ N = \frac{20(5+3t)}{1+0.04t}, \quad t \geq 0 \] where \( t \) is the time in years

a) What is the initial population of the deer?

b) What is the population of the deer after 10 years?

c) After how many years will the population reach 1220?

_Solve by using the quadratic formula._

7. \[ 2x^2 + 8x = -1 \] Exact: ______________  Approximate: ______________
Algebra 3 – Unit 2 Think Piece

Situation 1:
A baseball player hits the ball. Its height \( h \), above the ground (in feet) after \( t \) seconds is given as
\[
    h = -5(t - 3)^2 + 45
\]

(a) Draw a graph that represents the above situation. Label both the axes, vertex and the intercepts (you must show in the space to the right of the graph how you got both the \( y \)-intercept and the \( x \)-intercepts mathematically.

\[
    x\text{-intercept(s)}: \text{ } \text{ and } \text{ }
\]
\[
    Work: \\
\]
\[
    y\text{-intercept}: \text{ }
\]
\[
    Work: \\
\]

(b) How long does it take for the ball to reach its maximum height?

(c) What is the maximum height reached by the ball?

(d) Approximately, how long does it take for the ball to reach the ground?

(e) What is the height of the ball 2 seconds after it has been hit?

(f) After how much time is the ball at the height of 25 feet? Explain the two answers that your get, in this context.

(g) Rewrite the function in the form: \( h(t) = ax^2 + bx + c \)
Situation 2.
A cylindrical container of chocolate drink mix has a volume of 162 cubic inches. The radius, $r$, of the container can be found by using the formula

$$r = \sqrt{\frac{V}{\pi h}}$$

where $V$ is the volume of the container and $h$ is the height.

(a) If the radius is 2.5 inches, find the height of the container. Round to two decimal places.

Work:

(b) If the height of the container is 10 inches, find the radius. Round to two decimal places.

Work:

(c) Why do negative values of $h$ have no meaning here?

(d) Why do negative values of $r$ have no value here?

(e) Consider a different cylindrical container with a radius of 1.75 inches and a height of 5 inches. Using the same equation above, find the volume of the container. Round to two decimal places.
Algebra 3 – Unit 2 Test Review

Solve the following equations using the requested method.

1. Factoring:  
   \[ 2x^2 - 13 = 11x \] 
2. Factoring:  
   \[ 2x^2 - 13x = 15 \]

3. Quadratic Formula:  
   \[ 7x^2 + 1x = 8 \] 
4. Quadratic Formula:  
   \[ 3x^2 - 6 = 8x \]

5. Completing the Square:  
   \[ x^2 + 4x - 47 = 0 \] 
6. Completing the Square:  
   \[ 0 = -2x^2 - 56x - 66 \]

7. Graphing Calculator  
   (round to 2 places)  
   \[ y = -2x^2 + 5x - 1 \]  
8. Graphing Calculator  
   (round to 2 places)  
   \[ y = x^2 + 7x + 2 \]
Solve. Check for extraneous solutions.

9. \( \sqrt{2x - 5} + 4 = 1 \) 
10. \( \frac{1}{3} \sqrt[3]{4x + 1} = -1 \)

11. \( 5(2x + 3)^{2/3} = 20 \) 
12. \( 2 + (x - 1)^{3/2} = 10 \)

13. \( \frac{x}{x - 1} - \frac{2}{x} = \frac{1}{x - 1} \) 
14. \( \frac{1}{x-4} + \frac{x}{x-2} = \frac{2}{x^2 - 6x + 8} \)

Solve and answer the real world application.

15. Alan throws a stone off a bridge and into a river below. The stone’s height above the water in meters, \( h(x) \), depends on time in seconds after throwing, \( x \), and can be modeled with the function \( h(x) = -5x^2 + 10x + 15 \).

a) Sketch the situation.

b) What is the height of the stone at the time it is thrown?

c) How many seconds after being thrown, will the stone hit the water?