1. Find the slope of the line that contains (1, 6) and (10, -9).
   a. \( \frac{-1}{11} \)  
   b. \( \frac{-1}{5} \)  
   c. \( \frac{-3}{11} \)  
   d. \( \frac{-5}{9} \)  

2. Find the slope of the line described by \( x - 3y = -6 \).
   a. \( \frac{1}{3} \)  
   b. \( \frac{1}{3} \)  
   c. \( \frac{1}{2} \)  
   d. 3

3. Tell whether the equation \( -x + 4y = -2 \) represents a direct variation. If so, identify the constant of variation.
   a. Direct variation, \( k = -2 \)  
   b. Direct variation, \( k = \frac{1}{4} \)  
   c. Direct variation, \( k = 4 \)  
   d. Not a direct variation

4. Write the equation that describes the line with slope = 2 and \( y \)-intercept = \( \frac{3}{2} \) in slope-intercept form.
   a. \( y = \frac{3}{2}x + 2 \)  
   b. \( x = 2y + \frac{3}{2} \)  
   c. \( y = 2x + \frac{3}{2} \)  
   d. \( 2x + y = \frac{3}{2} \)

5. Write the equation that describes the line in slope-intercept form.
   slope = 4, point (3, -2) is on the line
   a. \( y = 4x + 14 \)  
   b. \( y = 4x - 14 \)  
   c. \( y = 4x + 10 \)  
   d. \( y = 4x - 2 \)

6. Write an equation in slope-intercept form of the line with slope \( \frac{1}{2} \) that contains the point (-4, -3).
   a. \( y = \frac{1}{2}x - 2 \)  
   b. \( y = \frac{1}{2}x - 3 \)  
   c. \( y = \frac{1}{2}x - 5 \)  
   d. \( y = \frac{1}{2}x - 4 \)

7. The equations of four lines are given. Identify which lines are parallel.
   Line 1: \( y = 8x - 3 \) \( m = 8 \)
   Line 2: \( y - 6 = \frac{1}{8}(x - 4) \) \( m = \frac{1}{8} \)
   Line 3: \( y = 3x + 4 \) \( m = 3 \)
   Line 4: \( x - \frac{1}{3}y = -4 \) \( m = 3 \)
   a. Lines 2 and 3 are parallel.  
   b. Lines 3 and 4 are parallel.  
   c. All four lines are parallel.  
   d. Lines 1 and 3 are parallel.

8. Write an equation in slope-intercept form for the line perpendicular to \( y = 8x - 9 \) that passes through the point (9, -9).
   a. \( y = 8x - 81 \)  
   b. \( y = 8x + \frac{63}{4} \)  
   c. \( y = 8x - 9 \)  
   d. \( y = \frac{1}{8}x + \frac{585}{4} \)

9. The Fun Guys game rental store charges an annual fee of $5 plus $5.50 per game rented. The Game Bank charges an annual fee of $17 plus $2.50 per game rented. For how many game rentals will the cost be the same at both stores? What is that cost?
   a. 4 games; $27  
   b. 6 games; $38  
   c. 3 games; $22  
   d. 2 games; $16
Semester 1 Exam Review - Chapter 1

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. Which of these is the domain and range for the parent cubic function?
   - Domain: all real numbers
     Range: all real numbers
   - Domain: \( x \geq 0 \)
     Range: \( y \geq 0 \)
   - Domain: \( x \geq 0 \)
     Range: \( y \leq 0 \)
   - Domain: \( x \geq 0 \)
     Range: \( y \leq 0 \)

2. Perform the given transformation on the given point. Give the coordinates of the transformed point.
   \((4, -4); \) vertical compression by a factor of \( \frac{1}{2} \)
   - \((2, 2)\)  \((2, -2)\)
   - \((-2, 2)\)  \((4, -2)\)

3. The graph of a function \( y = f(x) \) passes through the points \((4, -2)\) and \((6, 8)\). What are the coordinates of these points after \( y = f(x) \) has been stretched horizontally by a factor of 2?
   - \((2, -2)\) and \((3, 8)\)
   - \((4, -4)\) and \((6, 8)\)
   - \((8, -2)\) and \((12, 16)\)
   - \((8, -2)\) and \((12, 8)\)

4. Describe the transformation of \( f(x) \) given by \( f(x + 1) - 2 \).
   - Horizontal shift left 1 unit
   - Vertical shift down 2 units
   - Shift left 1 unit and down 2 units
   - Shift left 2 units and down 1 unit

Short Answer

1. What is the domain and range for the parent function of \( g(x) = x^2 + 1 \)?
   
   Domain: All Real #'s
   Range: \( \{ y \mid y \geq 1 \} \)

2. Perform the given translation on the given point. Give the coordinates of the translated point.
   \((3, 4); \) vertical shift 3 units up and horizontal shift 2 units right
   - \((5, 7)\)

3. Identify the parent function of \( g(x) = (x - 3) + 1 \) from its function rule.
   Parent: \( f(x) = x \)
   Linear shifted 3 right, up 1

4. Let \( g(x) \) be a vertical translation up 2 units followed by a reflection over the \( y \)-axis of \( f(x) = 3x - 4 \). Write the rule for \( g(x) \).
   \[ f(x) = 3x - 4 \]
   \[ g(x) = (3x - 4) + 2 = 3x - 2 \ (\text{up 2 units}) \]
   \[ g(x) = 3(-x) - 2 = -3x - 2 \ (\text{reflect over y-axis}) \]

5. Let \( g(x) \) be a horizontal compression by a factor of \( \frac{1}{3} \) of \( f(x) = \frac{3}{4}x - 2 \). Write the rule for \( g(x) \).
   \[ g(x) = \frac{3}{4}[3x] - 2 = \frac{9}{4}x - 2 \]

6. Describe the transformation of \( f(x) \) given by \( f(x + 3) - 11 \).
   3 units left, 11 units down

7. If \( g(x) \) is a horizontal translation 2 units right of \( f(x) = 4x + 7 \), what is the rule for \( g(x) \)?
   \[ g(x) = 4(x - 2) + 7 \]
   \[ g(x) = 4x - 8 + 7 \]
   \[ g(x) = 4x - 1 \]
10. Solve \( \begin{cases} 2x - 5y = -7 \\ 5x - 3y = 11 \end{cases} \) by elimination. Express your answer as an ordered pair.
   a. \((3, 4)\)
   b. \((3, 2)\)
   c. \((4, 3)\)
   d. \((4, 8)\)

11. Classify \( \begin{cases} x - 8y = 6 \\ 2x - 16y = 12 \end{cases} \). Give the number of solutions.
   a. This system is consistent. It has infinitely many solutions.
   b. This system is inconsistent. It has infinitely many solutions.
   c. This system is inconsistent. It has no solutions.
   d. This system is consistent. It has one solution.

**Numeric Response**

1. Find the value of \( a \) such that the points \((4, a)\) and \((8, 3a)\) lie on a line with slope \( m = \frac{1}{3} \):
   \[
   \frac{3a-a}{8-4} = \frac{2a}{4} = \frac{1}{3} \implies a = 4 \implies a = \frac{4}{3} \]

2. What value of \( n \) in the equation \( nx + 7 = 4y \) would give a line with slope \( 2 \)?
   \[
   y = \frac{n}{4}x + \frac{7}{4} \implies n = 8 \implies a = \frac{1}{2} \]

3. The lines described by \( y = (4a - 6)x \) and \( y = \frac{1}{2}x \) are perpendicular. What is the value of \( a \)?
   \[
   4a - 6 = -\frac{1}{2} \implies a = 1 \]

4. What value of \( b \) will make the system \( y = 5x + 6 \) and \( y = 1.5x + b \) intersect at the point \((0, 6)\)?
   \[
   b = 6 \]

**Short Answer**

1. Graph the line with the slope \( \frac{1}{3} \) and \( y \)-intercept \(-2\).

2. Graph the line described by the equation \( y - 2 = \frac{1}{3}(x - 3) \).

3. Solve \( \begin{cases} 3x + y = -3 \\ y = x + 5 \end{cases} \) by substitution. Express your answer as an ordered pair.
   \[
   A = \begin{bmatrix} 2 & -1 & 1 \\ 3 & 4 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} -5 \\ -2 \end{bmatrix}, \quad A^{-1}B = \begin{bmatrix} 1 \\ 3 \end{bmatrix} \]
   \[
   a = 1, \quad b = 3, \quad c = 4 \]

4. Solve \( \begin{cases} a - b = -2 \\ 2a + b = 5 \end{cases} \) using matrices.

5. The second angle of a triangle is 50° less than four times the first angle. The third angle is 40° less than the first. Find the measures of the three angles.
   \[
   x = 4y - 50, \quad x - 4y = -50 \]
   \[
   z = y - 40, \quad -y + z = -40 \]
   \[
   x + y + z = 180, \quad x + y + z = 180 \]
   \[
   1st < = 45°, \quad 2nd < = 136°, \quad 3rd < = 5° \]
Multiple Choice Identify the choice that best completes the statement or answers the question.

1. The parent function $f(x) = x^2$ is reflected across the $x$-axis, vertically stretched by a factor of 10, and translated right 10 units to create $g$. Use the description to write the quadratic function in vertex form.
   a. $g(x) = 10(x + 10)^2$
   c. $g(x) = 10(x - 10)^2$
   b. $g(x) = -10(x + 10)^2$
   d. $g(x) = -10(x + 10)^2$

2. Identify the axis of symmetry for the graph of $f(x) = x^2 + 2x - 3$.
   a. $x = -1$
   c. $y = -1$
   b. $y = -4$
   d. $x = -4$

3. Find the minimum or maximum value of $f(x) = x^2 - 2x - 6$. Then state the domain and range of the function.
   a. The maximum value is 1. D: {all real numbers}; R: $\{y | y \leq -7\}$
   b. The minimum value is -7. D: {x | $x \geq -7$}; R: {all real numbers}
   c. The maximum value is 1. D: {x | $x \geq -7$}; R: {all real numbers}
   d. The minimum value is -7. D: {all real numbers}; R: {y | $y \geq -7$}

4. Find the zeros of $f(x) = x^2 + 6x - 7$ by using a graph and table.
   a. 7 and -1
   c. -2 and 9
   b. -7
   d. -7 and 1

5. Find the zeros of the function $h(x) = x^2 + 23x + 60$ by factoring.
   a. $x = 4$ or $x = 15$
   c. $x = -4$ or $x = -15$
   b. $x = -20$ or $x = -3$
   d. $x = 20$ or $x = 3$

6. A toy rocket is launched from the ground level with an initial vertical velocity of 96 ft/s. After how many seconds will the rocket hit the ground?
   a. 6 seconds
   b. $\sqrt{6}$ seconds
   c. 0 seconds or 6 seconds
   d. 0 seconds

7. Solve the equation $x^2 - 10x + 25 = 54$.
   a. $x = 5 \pm 3\sqrt{6}$
   c. $x = 5 - 3\sqrt{6}$
   b. $x = 5 + 3\sqrt{6}$
   d. $x = 5 + 3\sqrt{6}$

8. Complete the square for the expression $x^2 - 16x + 64$. Write the resulting expression as a binomial squared.
   a. $(x - 8)^2$
   b. $(x + 8)^2$
   c. $(x + 16)^2$
   d. $(x - 16)^2$

9. Solve the equation $2x^2 + 18 = 0$.
   a. $x = 3 \pm i$
   b. $x = 3$
   c. $x = \pm 3i$
   d. $x = \pm 3 + i$

10. Find the complex conjugate of $3i + 4$.
    a. $-4 - 3i$
    b. $-4 + 3i$
    c. $4 + 3i$
    d. $4 - 3i$

11. Find the number and type of solutions for $x^2 - 9x = -8$.
    a. Cannot determine without graphing.
    b. The equation has one real solution.
    c. The equation has two nonreal complex solutions.
    d. The equation has two real solutions.

12. Add. Write your answer in standard form.
    $$(5a^2 - a^4) + (a^2 + 7a^4 - 2)$$
    a. $6a^5 + 6a^4$
    b. $a^5 + 6a^4 - 2$
    c. $6a^5 + 6a^4 - 2$
13. Divide by using synthetic division.
   \[(x^2 - 9x + 10) \div (x - 2)\]
   a. \[x - 11 + \frac{32}{x - 2}\]
   b. \[x - 9 + \frac{6}{x - 2}\]
   c. \[2x - 18 + \frac{10}{x - 2}\]
   d. \[x - 7 + \frac{4}{x - 2}\]

14. Evaluate \[D(x) = 4x^{10} + 6x^8 - 8x^4 - 2x^5 - 2x^4 - 7x^2 + 5\] for \(x = -1\).

   \[\begin{array}{cccc}
   2 & -9 & 10 & 2 & -14 \\
   1 & -7 & -4 & \\
   \end{array}\]

   \[\frac{-14}{4} \quad \frac{6}{-4} \quad \frac{0}{-1} \quad \frac{-2}{-2} \quad \frac{0}{0} \quad \frac{-7}{-7} \quad \frac{10}{10} \quad \frac{-2}{-2} \quad \frac{-14}{-14} \quad \frac{5}{5} \]

   \[\frac{-4}{-4} \quad \frac{18}{18} \quad \frac{-18}{-18} \quad \frac{20}{20} \quad \frac{-18}{-18} \quad \frac{11}{11}\]

15. Using the graph of \(f(x) = x^2\) as a guide, describe the transformations, and then graph the function.
   \[g(x) = (x + 6)^2 - 2\]
   Left 6 units, down 2
   Vertex \((-6, -2)\)

16. Solve the equation \(x^2 = 3 - 2x\) by completing the square.
   \[x^2 + 2x + 1 = 3 + 1\]
   \[x^2 + 2x + 1 = 4\]
   \[(x+1)^2 = 4\]
   \[x+1 = \pm 2\]
   \[x = -1 \pm 2\]
   \[x = 1, -3\]

17. Factor \(x^3 + 5x^2 - 9x - 45\).
   \[x + 3\] \(x + 5\]
   \[x^2 - 9(x + 5)\]
   \[(x+3)(x-3)(x+5)\]

18. Find the product \((x-2)^3\).
   \[x - 0x^2 + 12x - 8x^3\]

19. What expression is equivalent to \((3 - 2i)^2\)?
   \[(3-2i)(3-2i) = 9 - 12i + 4i^2 = 5 - 12i\]

20. Graph \(g(x) = 4x^3 - 24x + 9\) on a calculator, and estimate the local maxima and minima.

21. Write an equation for a quadratic function in standard form with zeros of -4 and 7.
   \[(x+4)(x-7) = x^2 - 3x - 28 = 0\]

22. Express \(6\sqrt{48}\) in terms of \(i\).
   \[
   6\sqrt{48} = 6 \cdot 4i \sqrt{3} = 24i \sqrt{3}
   
   \]

23. Find the zeros of \(f(x) = x^2 - 5x + 5\) by using the Quadratic Formula.
   \[x = \frac{5 \pm \sqrt{25 - 20}}{2} = \frac{5 \pm \sqrt{15}}{2}\]

24. Solve the following inequality: \(x^2 - 13x + 36 < 0\).
   \[x^2 - 13x + 36 = (x-4)(x-9)\]
   \[x = 4, 9\]

25. Simplify: \((7 + 13i) - (-8 - 6i) = 15 + 19i\)

26. Simplify: \((5 - 3i)(2 - 3i) = -10 - 9i - 9i^2 = -10 - 9i + 9 = -1\)

27. Simplify: \(-3i2^2 = -3i \cdot 4 = -12i\)

28. Identify the degree of the monomial: \(18x^2y^3z\) \[\text{Degree 6}\]

29. Find the product: \((3 - y)(9 + 3y + y^2) = 27 + 9y + 3y^2 - 9y - y^2 = 27 - y^3\)

30. Use synthetic substitution to evaluate \(P(-5)\) for \(P(x) = x^3 - 4x^2 - 7\)
   \[\begin{array}{c}
   -5 \\
   -25 \quad 1 \\
   -125 \quad 1 \quad 725 \quad 1252 \\
   \end{array}\]

31. What is the vertex of \(g(x) = -2(x + 10)^2 + 11\)?
   \[\text{Vertex} (-10, 11)\]

32. Divide with long division: \((6x + 2x^3 - 4) \div (x - 1)\)
   \[\begin{array}{c|ccccc}
   \hline
   x - 1 & 2x^3 + 0x^2 + 6x - 4 \\
   \hline
   & -2x^3 + 2x^2 \\
   \hline
   & 2x^2 + 6x - 4 \\
   & -2x^2 - 2x \\
   \hline
   & 8x - 4 \\
   & -8x + 8 \\
   \hline
   & 0 \\
   \hline
   \end{array}\]

   \[2x^2 + 2x + 8 + \frac{4}{x - 1}\]