



Name: _____

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Learning Objectives

- Write linear equations in slope-intercept and point-slope forms
- Determine equations of parallel and perpendicular lines
- Solve linear inequalities and absolute value equations/inequalities
- Find composite and inverse functions

For parallel lines: slopes are equal. For perpendicular lines: slopes are negative reciprocals ($m \cdot m = -1$). Always verify inverse functions using composition.

1. Find the slope and y-intercept. Write in slope-intercept form.

$$3x - 2y = 12$$

Answer: _____

2. Write the equation of the line through (2, 5) and (-1, -4).

$$(2, 5) \text{ and } (-1, -4)$$

Answer: _____

3. Write the equation of the line parallel to $2x + 3y = 9$ passing through (0, -2).

$$2x + 3y = 9, \text{ through } (0, -2)$$

Answer: _____

4. Write the equation of the line perpendicular to $y = 4x + 1$ through (4, 3).

$$y = 4x + 1, \text{ through } (4, 3)$$

Answer: _____

5. Solve the linear inequality. Write the solution in interval notation.

$$3x - 7 > 2(x - 1)$$

Answer: _____

6. Solve the compound inequality.

$$-2 \leq \frac{3x + 1}{4} < 5$$

Answer: _____



7. Solve the absolute value equation.

$$|2x - 5| = 9$$

Answer: _____

8. Solve the absolute value inequality. Write in interval notation.

$$|3x + 1| \leq 8$$

Answer: _____

9. Evaluate $f(g(x))$ if $f(x) = 2x + 3$ and $g(x) = x^2 - 1$.

$$f(x) = 2x + 3, \quad g(x) = x^2 - 1$$

Answer: _____

10. Find the inverse of $f(x)$. Verify $f(f^{-1}(x)) = x$.

$$f(x) = \frac{3x - 2}{5}$$

Answer: _____





Problems 3–4: parallel vs perpendicular — critical distinction. Problems 7–8: absolute value setup must split into two cases ($=$) or compound inequality (\leq/\geq). Problem 10 (inverse): full verification required.

Solutions

1. Find the slope and y-intercept. Write in slope-intercept form.

$$3x - 2y = 12$$

→ Solve for y: $-2y = -3x + 12 \rightarrow y = (3/2)x - 6$.

→ Slope $m = 3/2$, y-intercept $b = -6$.

Answer: $y = \frac{3}{2}x - 6, \quad m = \frac{3}{2}, \quad b = -6$

2. Write the equation of the line through (2, 5) and (-1, -4).

(2, 5) and (-1, -4)

→ Slope: $m = (5 - (-4)) / (2 - (-1)) = 9/3 = 3$.

→ Point-slope: $y - 5 = 3(x - 2) \rightarrow y = 3x - 1$.

Answer: $y = 3x - 1$

3. Write the equation of the line parallel to $2x + 3y = 9$ passing through (0, -2).

$2x + 3y = 9$, through (0, -2)

→ Rewrite: $y = -(2/3)x + 3$. Parallel lines have the same slope: $m = -2/3$.

→ Through (0, -2): $y = -(2/3)x - 2$.

Answer: $y = -\frac{2}{3}x - 2$

4. Write the equation of the line perpendicular to $y = 4x + 1$ through (4, 3).

$y = 4x + 1$, through (4, 3)

→ Original slope $m = 4$. Perpendicular slope: $m_{\perp} = -1/4$.

→ Point-slope: $y - 3 = -(1/4)(x - 4) \rightarrow y = -(1/4)x + 1 + 3 = -(1/4)x + 4$.

Answer: $y = -\frac{1}{4}x + 4$

5. Solve the linear inequality. Write the solution in interval notation.

$$3x - 7 > 2(x - 1)$$

→ $3x - 7 > 2x - 2$.

→ $x > 5$.

→ Interval notation: $(5, \infty)$.

Answer: $x > 5, \quad (5, \infty)$



6. Solve the compound inequality.

$$-2 \leq \frac{3x+1}{4} < 5$$

→ Multiply all parts by 4: $-8 \leq 3x+1 < 20$.

→ Subtract 1: $-9 \leq 3x < 19$.

→ Divide by 3: $-3 \leq x < 19/3$.

Answer: $-3 \leq x < \frac{19}{3}, \left[-3, \frac{19}{3}\right)$

7. Solve the absolute value equation.

$$|2x - 5| = 9$$

→ $2x-5=9 \rightarrow x=7$, or $2x-5=-9 \rightarrow x=-2$.

Answer: $x = 7$ or $x = -2$

8. Solve the absolute value inequality. Write in interval notation.

$$|3x + 1| \leq 8$$

→ $-8 \leq 3x+1 \leq 8$.

→ $-9 \leq 3x \leq 7$.

→ $-3 \leq x \leq 7/3$. Interval: $[-3, 7/3]$.

Answer: $-3 \leq x \leq \frac{7}{3}, \left[-3, \frac{7}{3}\right]$

9. Evaluate $f(g(x))$ if $f(x) = 2x + 3$ and $g(x) = x^2 - 1$.

$$f(x) = 2x + 3, \quad g(x) = x^2 - 1$$

→ $f(g(x)) = f(x^2 - 1) = 2(x^2 - 1) + 3 = 2x^2 - 2 + 3 = 2x^2 + 1$.

Answer: $f(g(x)) = 2x^2 + 1$

10. Find the inverse of $f(x)$. Verify $f(f^{-1}(x)) = x$.

$$f(x) = \frac{3x-2}{5}$$

→ Replace $f(x)$ with y : $y = (3x-2)/5$.

→ Swap x and y : $x = (3y-2)/5$.

→ Solve for y : $5x = 3y - 2 \rightarrow y = (5x+2)/3$.

→ Verify: $f(f^{-1}(x)) = f((5x+2)/3) = (3(5x+2)/3 - 2)/5 = (5x+2-2)/5 = 5x/5 = x \checkmark$.

Answer: $f^{-1}(x) = \frac{5x+2}{3}$

