# MATH 150 — Linear Equations & Functions

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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 ($m_1 \cdot m_2 = -1$). 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).**

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

Answer: _____

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

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

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: _____



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**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) = x² – 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 (≤/≥). 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 → y=(3/2)x–6.*
→ *Slope m=3/2, y-intercept b=–6.*

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

**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) → y=3x–1.*

**Answer:** $y = 3x - 1$

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

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

→ *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).

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

→ *Original slope m=4. Perpendicular slope: m⊥=–1/4.*
→ *Point-slope: y–3=–(1/4)(x–4) → 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, ∞).*

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

**6.** Solve the compound inequality.

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

→ *Multiply all parts by 4: –8≤3x+1<20.*
→ *Subtract 1: –9≤3x<19.*
→ *Divide by 3: –3≤x<19/3.*

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

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**7.** Solve the absolute value equation.

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

→ *2x–5=9 → x=7, or 2x–5=–9 → x=–2.*

**Answer:** $x = 7 \text{ or } x = -2$

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

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

→ *–8≤3x+1≤8.*
→ *–9≤3x≤7.*
→ *–3≤x≤7/3. Interval: [–3, 7/3].*

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

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**9.** Evaluate f(g(x)) if f(x) = 2x + 3 and g(x) = x² – 1.

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

→ *f(g(x)) = f(x²–1) = 2(x²–1)+3 = 2x²–2+3 = 2x²+1.*

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

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**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 → y=(5x+2)/3.*
→ *Verify: f(f■¹(x))=f((5x+2)/3)=(3(5x+2)/3–2)/5=(5x+2–2)/5=x ✓.*

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