

1. Completely factor each of the following.

- (a) $100x - x^2 - 2419 = -(x - 41)(x - 59)$
(b) $2p^4 - 162 = 2(p^2 + 9)(p + 3)(p - 3)$
(c) $357ab^2 - 30ab^2x - 3ab^2x^2 = -3ab^2(x + 17)(x - 7)$
(d) $3a^3 - 27ab^2 = 3a(a + 3b)(a - 3b)$
(e) $20x + 5x^3 = 5x(x^2 + 4)$

2. (Rational Expressions) Simplify each of the following.

- (a) $\frac{3x - 11}{11 - 3x} = -1$
(b) $\frac{495 - 3a^2 - 12a}{6a^2 - 36a - 330} = -\frac{a + 15}{2(a + 5)}$
(c) $\frac{x^2 - 6x - 7}{2x^2 - 98} \div \frac{x^2 - 4x - 5}{x + 7} = \frac{1}{2x - 10}$
(d) $\frac{2x - 13}{x - 5} - \frac{3}{5 - x} = 2$
(e) $\frac{1}{x - 5} - \frac{4(x - 1)}{6x + x^2 - 55} = -\frac{3}{x + 11}$

3. (Radical Expressions) Simplify each of the following.

- (a) $\sqrt{75} - \sqrt{108} + 5\sqrt{12} = 9\sqrt{3}$
(b) $(2\sqrt{5} + 3)(2\sqrt{5} - 3) = 11$
(c) $(2\sqrt{5} - 3)^2 = 29 - 12\sqrt{5}$
(d) $(2\sqrt{5} - 3)^3 = 94\sqrt{5} - 207$
(e) Rationalize the denominator in $\frac{6}{\sqrt{11} + 3} = 3\sqrt{11} - 9$
(f) Rationalize the denominator in $\frac{4}{\sqrt{15} - 3} = \frac{2\sqrt{15} + 6}{3}$

4. Let $a = \sqrt{5} - 1$. Find the exact value of each of the following expressions.

- (a) $(a + 1)^2 = 5$
(b) $a^2 + a - 1 = 4 - \sqrt{5}$
(c) $(a - 1)^2 = 9 - 4\sqrt{5}$
(d) $a^2 + 2a - 9 = -5$

5. (Equations) Solve each of the following equations. Make sure to check your solutions.

(a) $3(x - 5) - 5(x - 1) = -2x + 1$ no solution

(b) $(3x)^2 - (x + 3)(5x - 3) = (5 - 2x)^2 - 16$ 0

(c) $(x + 4)(1 - 2x) = 3x - 2(x - 3)^2$ 1

(d) $2x^3 = 20x^2 + 1750x$ 35, 0, -25

6. Solve each of the following inequalities. Graph the solution set.

(a) $\frac{1}{5}x - \frac{2}{3} < \frac{26}{15}$ $x < 12$

(b) $3w - 5 \leq 5(w - 2)$ $x \geq \frac{5}{2}$

(c) $7(j - 5) + 9 > 2(-2j + 5) + 5j$ $x > 6$

7. Solve each of the following systems of linear equations.

(a) dependent system; there are infinitely many solutions

$$\begin{aligned}2x - 3y &= 24 \\ y &= \frac{2}{3}x - 8\end{aligned}$$

(b) (3, -8)

$$\begin{aligned}2x - y &= 14 \\ 5x + 2y &= -1\end{aligned}$$

(c) inconsistent system; there is no solution

$$\begin{aligned}2x - 5y &= 20 \\ x - 5 &= \frac{5}{2}y + 1\end{aligned}$$

8. Word Problems.

- (a) We have 73 coins, all nickels and dimes. The total value of the coins is \$ 6. How many nickels and dimes do we have?

26 nickels and 47 dimes

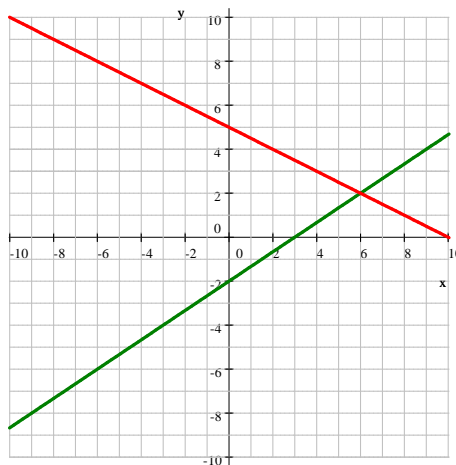
- (b) We throw an object upward from the top of a 1200 ft high building. The height of the object, (measured in feet) t seconds after we threw it is

$$h(t) = -16t^2 + 160t + 1200$$

- i. Where is the object 3 seconds after we threw it? 1536 ft
 ii. How long does it take for the object to hit the ground? 15 seconds

9. Consider the equations $y = \frac{2}{3}x - 2$ and $y = -\frac{1}{2}x + 5$.

- (a) Graph these lines in the same coordinate system. Use your graph to find the coordinates where the points intersect. (6, 2)



- (b) Use algebraic methods to check your answer for part a).

Solution: Is the point (6, 2) on the line $y = \frac{2}{3}x - 2$?

$$\text{LHS} = y = 2$$

$$\text{RHS} = \frac{2}{3}(6) - 2 = 4 - 2 = 2 \implies \text{yes}$$

Is the point (6, 2) on the line $y = -\frac{1}{2}x + 5$?

$$\text{LHS} = y = 2$$

$$\text{RHS} = -\frac{1}{2}(6) + 5 = -3 + 5 = 2 \implies \text{yes}$$