

1. Perform the operations as indicated.

$$(a) \sqrt{(-1)^4 - 6(2^2 - (-3)^2) - (-1)^3 + 10 \div 5 \cdot 2} = 6$$

$$(b) \frac{-3^2 - (-3)^2 - 16 \div (-2) \cdot (-2) + (-2)^2}{|(-4)(-7) - (-2)|} = -1$$

$$(c) \frac{(-1)^2 - \left(-\frac{1}{2}\right)^2}{5\frac{5}{8}} + \frac{1}{5} = \frac{1}{3}$$

$$(d) \frac{2}{3} - \frac{3}{5} \left(-\frac{1}{3}\right)^2 = \frac{3}{5}$$

$$(e) ||2 - 3^3| - 4^2| = 9$$

$$(f) -|-5| = -5$$

2. Evaluate $15 - |-x - x^2 + 5|$ if

$$(a) x = 0 \quad 10$$

$$(b) x = 2 \quad 14$$

$$(c) x = -2 \quad 12$$

$$(d) x = \frac{1}{2} \quad \frac{43}{4}$$

3. Evaluate $\frac{3ab + 2a^2 - 2b^2}{a + 2b}$ if

$$(a) a = 2 \text{ and } b = -3 \quad 7$$

$$(b) a = -1 \text{ and } b = -2 \quad 0$$

$$(c) a = -6 \text{ and } b = 3. \quad \text{undefined}$$

$$(d) a = -\frac{1}{2} \text{ and } b = \frac{3}{4} \quad -\frac{7}{4}$$

4. Consider the equation $-x^2 + 2x^3 + 3 = -4x(x - 2)$. For each of the numbers given, determine whether it is a solution of the equation or not.

$$(a) x = -2 \quad -17 \neq -32 \implies \text{no}$$

$$(b) x = -\frac{1}{2} \quad \frac{5}{2} \neq -5 \implies \text{no}$$

$$(c) x = \frac{1}{2} \quad 3 = 3 \implies \text{yes}$$

$$(d) x = -3 \quad -60 = -60 \implies \text{yes}$$

5. (Exponential Expressions.) Simplify each of the following.

$$(a) (2x^5)(x^4) = 2x^9$$

$$(b) (2x^5)^4 = 16x^{20}$$

$$(c) (-xy)^2(-xy^2)^3 = -x^5y^8$$

$$(d) \frac{(2ab)^3(-3a^2b)^2}{-b(6ab^2)^2} = -2a^5$$

6. Completely factor each of the following.

$$(a) 100x - x^2 - 2419 = -(x - 41)(x - 59)$$

$$(b) 2p^4 - 162 = 2(p^2 + 9)(p + 3)(p - 3)$$

$$(c) x^2 - 4x + 7 = \text{does not factor over the real numbers}$$

$$(d) 357ab^2 - 30ab^2x - 3ab^2x^2 = -3ab^2(x + 17)(x - 7)$$

$$(e) 3a^3 - 27ab^2 = 3a(a + 3b)(a - 3b)$$

$$(f) 20x + 5x^3 = 5x(x^2 + 4)$$

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

$$(a) \frac{2x - 7}{3} = -1 \quad 2$$

$$(b) \frac{x + 8}{3} = -2 \quad -14$$

$$(c) \frac{x}{3} + 8 = -2 \quad -30$$

$$(d) \frac{1}{5}x - \frac{2}{3} = \frac{26}{15} \quad 12$$

$$(e) \frac{3}{8}x + \left(1\frac{4}{5}\right) = \frac{3}{10} \quad -4$$

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

$$(g) 7(j - 5) + 9 = 2(-2j + 5) + 5j \quad 6$$

$$(h) 3(x - 5) - 5(x - 1) = -2x + 1 \quad \text{no solution}$$

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

$$(a) |3x + 1| - 7 = 1 \quad -3, \frac{7}{3}$$

$$(b) |3x + 1| - 1 = -11 \quad \text{no solution}$$

$$(c) \left|\frac{1}{2}x - 3\right| - 2 = -23 \quad \text{no solution}$$

$$(d) \left|\frac{1}{2}x - 3\right| - 2 = 23 \quad -44, 56$$

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

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

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

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

10. Word Problems.

(a) A TV is priced at \$ 600. How much would it cost if it went on a 15% sale? **\$ 510**

(b) We have placed \$ 5000 in a bank account with an annual interest rate of 6%. How much money do we have in the account after one year? **\$ 5300**

(c) Ann took four exams. Her scores on the first three exams were 63, 76, and 68. How many points did she earn on the fourth exam if her average is 71? **77**

(d) If we multiply a number by -2 and add 7, the result is 25. Find this number. **-9**

(e) If we subtract 5 from the opposite of a number, we get -1 . Find this number. **-4**

(f) Three times a number is 5 more than 16. Find this number. **7**

(g) One number is 18 less than the other. Find these numbers if their sum is 110. **46 and 64**

(h) One number is 18 less than the other. Find these numbers if their product is 1600.
32, 50 and $-50, -32$

(i) The product of 3 and the opposite of a number is -63 . Find this number. **21**

(j) One side of a rectangle is 4 in shorter than 3 times the other side. Find the sides of the rectangle if its perimeter is 48 in. **7 in and 17 in**

(k) A bank teller has 47 more five-dollar bills than ten-dollar bills. The total value of the money is \$1000. How much of each denomination of bill does he have? **51 ten-dollar bills and 98 five-dollar bills**

(l) 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**

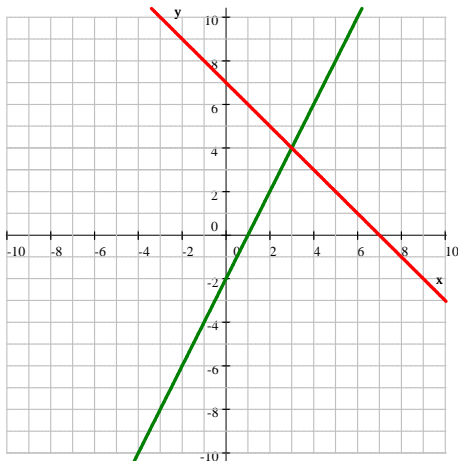
(m) A certain triangle's longest side is one centimeter less than six times the shortest side. The other side is five times the shortest side. The perimeter is thirty-five centimeters. Find the length of the longest side. **17 cm**

(n) Find all numbers that satisfy the following condition: if we square the number, we get back the same number. **0, 1**

(o) Find all numbers that satisfy the following condition: if we raise the number to the third power, the result is four times the original number. **0, 2, -2**

11. Consider the equations $2x - y = 2$ and $y = -x + 7$.

- (a) Graph these lines in the same coordinate system. Use your graph to find the coordinates where the points intersect. $(3, 4)$



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

Solution: Is the point $(3, 4)$ on the line $2x - y = 2$?

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

Is the point $(3, 4)$ on the line $y = -x + 7$?

$$\text{LHS} = y = 4$$

$$\text{RHS} = -x + 7 = -3 + 7 = 4 \implies \text{yes}$$

12. Graph the parabola $y = -8x + x^2 + 15$. Clearly label the coordinates of five points on the parabola, including vertex and intercepts. **Vertex:** $(4, -1)$, **y -intercept:** $(0, 15)$, **x -intercepts:** $(3, 0)$ and $(5, 0)$

