

Chapter 1: Equations and Inequalities

Evaluate the power.

1. $-(2^4) = -(16) = \boxed{-16}$

2. $(-2)^4 = \boxed{16}$

Use the order of operation to evaluate each expression.

3. $(7 - 2)^2 + 3(-3) - 12$
 $(5)^2 + (-9) - 12$
 $25 - 9 - 12 = \boxed{4}$

4. $5 + 3(4 - 7) - 3$
 $5 + 3(-3) - 3$
 $5 - 9 - 3 = \boxed{-7}$

Evaluate the expression for the given value of x.

5. $x^2 + 2x - 4$ when $x = -3$

$$\begin{aligned} (-3)^2 + 2(-3) - 4 \\ 9 - 6 - 4 = \boxed{-1} \end{aligned}$$

Simplify the expression.

7. $-2(x + 1) + 4x$

$$\begin{aligned} -2x - 2 + 4x \\ \boxed{2x - 2} \end{aligned}$$

Solve each expression for the variable.

9. $2x + 5 = 19$

$$\begin{aligned} 2x = 14 \\ \boxed{x = 7} \end{aligned}$$

11. $6(x - 6) = -2x - 4$

$$\begin{aligned} 6x - 36 = -2x - 4 \\ 8x - 36 = -4 \\ 8x = 32 \\ \boxed{x = 4} \end{aligned}$$

13. $\frac{1}{2}y + 8 = 20$

$$\begin{aligned} \frac{1}{2}y = 12 - 8 \\ \boxed{y = 24} \end{aligned}$$

6. $3x + 5 - 3(x - 2)$ when $x = 2$

$$\begin{aligned} 3(2) + 5 - 3(2 - 2) \\ 6 + 5 - 3(0) \\ 6 + 5 - 0 = \boxed{11} \end{aligned}$$

8. $12 + -2y + 3x + 2y + -7x$

$$\boxed{12 - 4x}$$

10. $4(x - 2) = -32$

$$\begin{aligned} 4x - 8 = -32 \\ 4x = -24 \\ \boxed{x = -6} \end{aligned}$$

12. $-6x + 2 = 3x - 7$

$$\begin{aligned} 2 = 9x - 7 \\ 9 = 9x \\ \boxed{x = 1} \end{aligned}$$

14. $x - 6 = 6$

$$\boxed{x = 12}$$

Solve the formula for the given variable.

15. $P = 2L + 2W$ solve for W .

$$\frac{P - 2L}{2} = \frac{2W}{2}$$
$$W = \frac{P - 2L}{2}$$

16. $I = Prt$ solve for t .

$$\frac{I}{Pr} = t$$

17. Each day you exercise at a fitness center for 1 hour. You lift weights and do aerobics during each visit. Today you spent 25 minutes doing aerobics. If you spent 7 minutes at each weight-lifting machine, how many machines did you use?

$$y = 7x + 25$$
$$60 = 7x + 25$$

$$35 = 7x$$
$$x = 5 \text{ machines}$$

Solve each equation for y .

18. $-x + 2y = 6$

$$2y = x + 6$$
$$y = \frac{1}{2}x + 3$$

19. $-\frac{1}{2}y + 3x = 6$

$$-\frac{1}{2}y = (-3x + 6) \cdot -2$$
$$y = 6x - 12$$

Find the value of y for the given value of x .

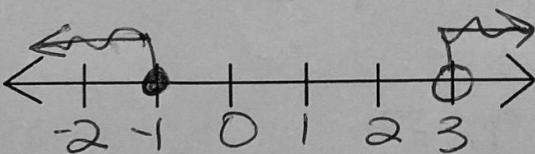
20. $2x - 2y = -16$ when $x = 4$

$$2(4) - 2y = -16$$
$$8 - 2y = -16$$
$$-2y = -24$$
$$y = 12$$

Solve the inequality and graph on a number line.

22. $2x + 3 \leq 1$ or $3x - 2 > 7$

$$2x \leq -2$$
$$x \leq -1$$
$$3x > 9$$
$$x > 3$$



24. $-3 < 2x + 3 < 7$

$$-6 < 2x < 4$$
$$-3 < x < 2$$

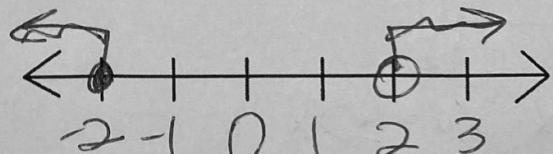
A number line from -3 to 3. There are tick marks at every integer. Open circles are at -3 and 2, and closed circles are at -1 and 1. The segment between -1 and 1 is shaded with a wavy line.

21. $2x + 5y = 18$ when $x = 9$

$$2(9) + 5y = 18$$
$$18 + 5y = 18$$
$$5y = 0$$
$$y = 0$$

23. $4x + 3 \leq -5$ or $x + 6 \geq 8$

$$4x \leq -8$$
$$x \leq -2$$
$$x + 6 \geq 8$$



25. $2x + 1 \geq -1$

$$2x \geq -2$$
$$x \geq -1$$

A number line from -3 to 3. There are tick marks at every integer. A closed circle is at -1, and an open circle is at 1. The region to the right of -1 is shaded with a wavy line.

Solve each equation.

26. $|x - 4| = 2$

$$x - 4 = 2$$

$$x = 6$$

$$x - 4 = -2$$

$$x = 2$$

27. $|x - 9| = 11$

$$x - 9 = 11$$

$$x = 20$$

$$x - 9 = -11$$

$$x = -2$$

28. $|2x - 6| = 4$

$$2x - 6 = 4$$

$$2x = 10$$

$$x = 5 \quad \text{and} \quad x = 1$$

$$2x - 6 = -4$$

$$2x = 2$$

29. $|2x + 1| + 3 = 6$

$$|2x + 1| = 3$$

$$2x + 1 = 3$$

$$2x = 2$$

$$x = 1$$

$$2x + 1 = -3$$

$$2x = -4$$

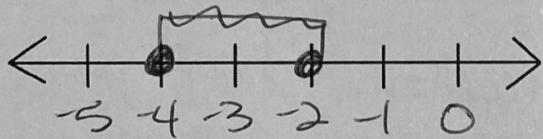
$$x = -2$$

Solve the absolute value inequality and graph on a number line.

30. $|x + 3| \leq 1$

$$x + 3 \leq 1 \quad x + 3 \geq -1$$

$$x \leq -2 \quad x \geq -4$$

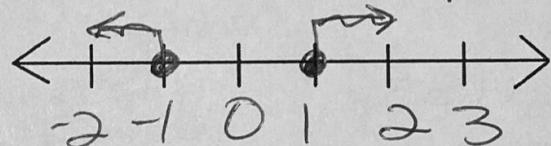


31. $|2x| + 6 \geq 2$

$$|2x| \geq 2$$

$$2x \geq 2 \quad 2x \leq -2$$

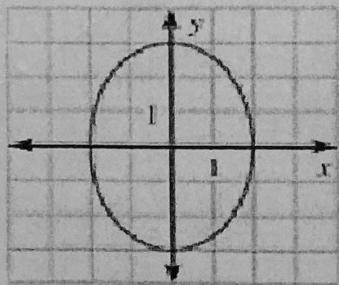
$$x \geq 1 \quad x \leq -1$$



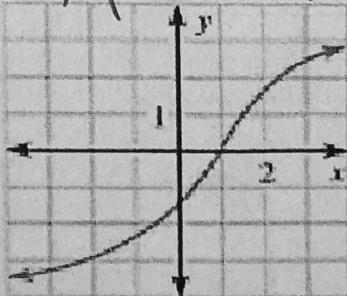
Chapter 2: Linear Equations and Functions

Is the relation a function.

1. no, fails vertical line test



2. yes, passes vertical line test



Evaluate the function for the given value of x.

3. $f(x) = 7x + 3$ when $x = -5$

$$\begin{aligned} 7(-5) + 3 \\ -35 + 3 = -32 \end{aligned}$$

4. $f(x) = 25 - 2x^2$ when $x = 6$

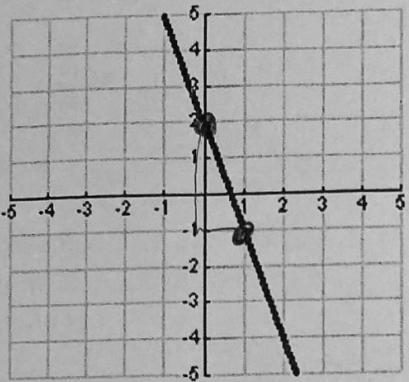
$$\begin{aligned} 25 - 2(6)^2 \\ 25 - 2(36) \\ 25 - 72 = -47 \end{aligned}$$

5. $f(x) = x^2 + x + 1$ when $x = -1$

$$\begin{aligned} (-1)^2 + (-1) + 1 \\ 1 - 1 + 1 = 1 \end{aligned}$$

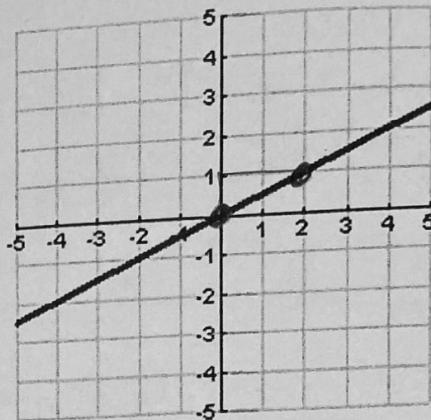
Find the slope of the line.

6.



$$m = -3$$

7.



$$m = \frac{3}{4}$$

Find the slope of the line passing through the given points. Tell which line is steeper.

8. Line 1 (2, 3) and (8, 15)

$$m = \frac{15-3}{8-2} = \frac{12}{6} = 2$$

10. Which line is steeper? line 1

9. Line 2 (5, -1) and (-10, 2)

$$m = \frac{2-(-1)}{-10-5} = \frac{3}{-15} = -\frac{1}{5}$$

Decide whether the line with the given slope rises, falls, is horizontal, or is vertical.

11. $m = -5/7$

falls

12. $m = 2/3$

rises

13. $m = 0$

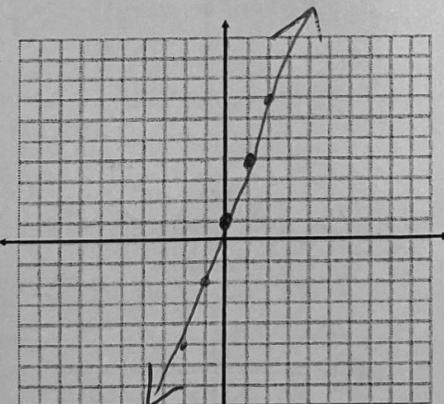
horizontal

14. $m = 9/0$

vertical

Graph the equation.

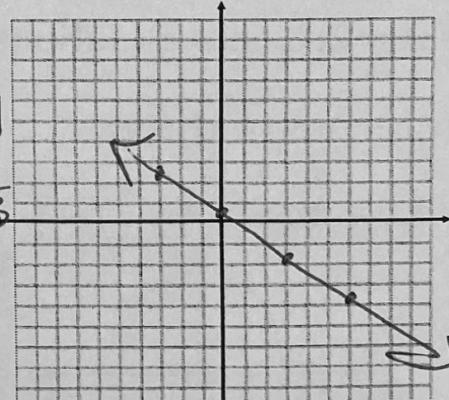
15. $y = 3x + 1$



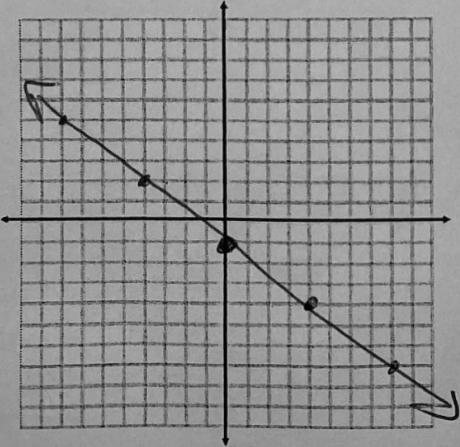
16. $2x + 3y = 1$

$$3y = -2x + 1$$

$$y = -\frac{2}{3}x + \frac{1}{3}$$



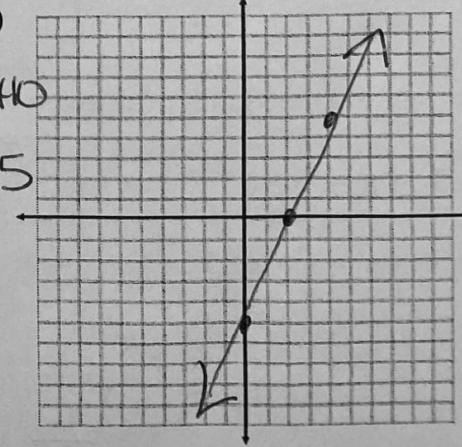
17. $y = -\frac{3}{4}x - 1$



18. $5x - 2y = 10$

$$-2y = -5x + 10$$

$$y = \frac{5}{2}x - 5$$



Write an equation of the line that has the given slope and y-intercept.

19. $m = 5$ and $b = 4$

$$y = 5x + 4$$

20. $m = 0$ and $b = 2$

$$y = 2$$

Write an equation of the line that passes through the given point and has the given slope.

21. $(1, 4)$ and $m = -2$

$$4 = -2(1) + b$$

$$4 = -2 + b$$

$$b = 6$$

$$\boxed{y = -2x + 6}$$

22. $(-2, -5)$ and $m = 3$

$$-5 = 3(-2) + b$$

$$-5 = -6 + b$$

$$b = 1$$

$$\boxed{y = 3x + 1}$$

$$y = mx + b$$

OR

$$y - y_1 = m(x - x_1)$$

Write an equation of the line that passes through the given points.

23. $(2, -1)$ and $(1, -6)$

$$m = \frac{-6 - (-1)}{1 - 2} = \frac{-5}{-1} = 5$$

$$-1 = 5(2) + b$$

$$-1 = 10 + b$$

$$b = -11$$

$$\boxed{y = 5x - 11}$$

24. $(1, 1)$ and $(5, 9)$

$$m = \frac{9 - 1}{5 - 1} = \frac{8}{4} = 2$$

$$1 = 2(1) + b$$

$$1 = 2 + b$$

$$b = -1$$

$$\boxed{y = 2x - 1}$$

Write an equation that is perpendicular to the given line at the given point.

25. Perpendicular to: $y = 3x + 2$ at the point $(3, 5)$

$$m_{\perp} = -\frac{1}{3}$$

$$5 = -\frac{1}{3}(3) + b$$

$$5 = -1 + b$$

$$b = 6$$

$$\boxed{y = -\frac{1}{3}x + 6}$$

Write an equation of the line that is parallel to the given line at the given point.

26. Parallel to: $y = -2x - 5$ at the point $(-1, 9)$

$$m_{||} = -2$$

$$9 = -2(-1) + b$$

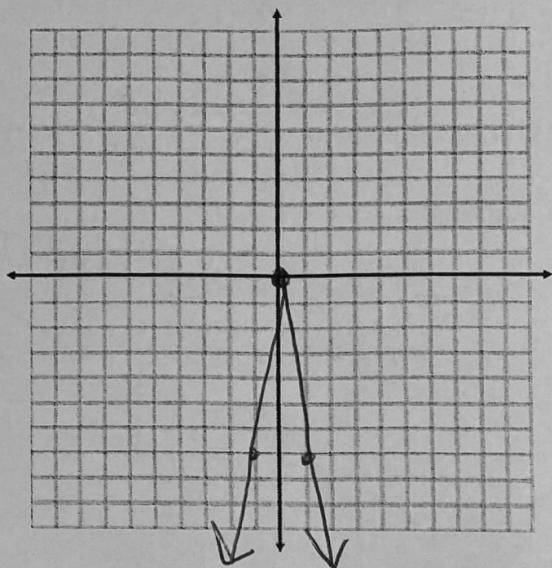
$$9 = 2 + b$$

$$b = 7$$

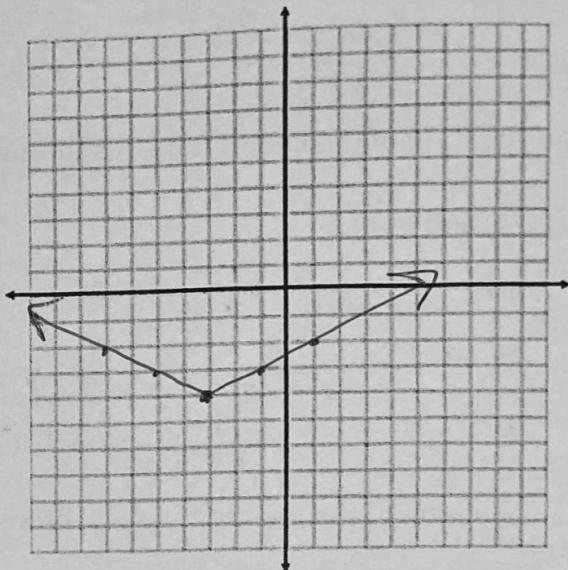
$$\boxed{y = -2x + 7}$$

Graph each equation.

27. $y = -7|x|$



28. $y = \frac{1}{2}|x + 3| - 4$



Chapter 3: Systems of Equations and Inequalities

Solve the systems using either substitution or linear combination.

1. $9x - 5y = -30$

$-9(x + 2y = 12)$

$$\begin{array}{r} -9x - 18y = -108 \\ 9x - 5y = -30 \\ \hline -23y = -138 \end{array}$$

$$\boxed{y = 6}$$

$$x + 2(6) = 12$$

$$\boxed{x = 0}$$

$$\boxed{(-2, 6)}$$

3. $(3x + 3y = 0)$

$-2x + 6y = -24$

$$\begin{array}{r} -6x - 6y = 0 \\ -2x + 6y = -24 \\ \hline -8x = -24 \end{array}$$

$$\boxed{x = 3}$$

$$\boxed{(3, -3)}$$

2. $2(2x + 3y = -7)$

$-4x - 5y = 13$

$$\begin{array}{r} 4x + 6y = -14 \\ -4x - 5y = 13 \\ \hline y = -1 \end{array}$$

$$\boxed{y = -1}$$

$$2x + 3(-1) = -7$$

$$2x - 3 = -7$$

$$2x = -4$$

$$\boxed{x = -2}$$

$$\boxed{(-2, -1)}$$

$$3(3) + 3y = 0$$

$$9 + 3y = 0$$

$$3y = -9$$

$$\boxed{y = -3}$$

solve the system.

$$4. \quad x + 2y - z = 3$$

$$3(-x + y + 3z = -5)$$

$$3x + y + 2z = 4$$

$$\begin{array}{r} 1+2: \\ x + 2y - z = 3 \\ -x + y + 3z = -5 \\ \hline -4(3y + 2z = -2) \end{array}$$

$$\begin{array}{r} 2+3: \\ -3x + 3y + 9z = -15 \\ 3x + y + 2z = 4 \\ \hline 3(4y + 11z = -11) \end{array}$$

$$\begin{array}{r} 3 \\ -12y - 8z = 8 \\ 12y + 33z = -33 \\ \hline 25z = -25 \quad |z = -1 \end{array}$$

6. Solve the following system of equations by graphing

$$4x + 2y = 5 \rightarrow 2y = -4x + 5$$

$$8x + 4y = 10 \quad y = -2x + 5/2$$

$$\begin{array}{l} 4y = -8x + 10 \\ y = -2x + 5/2 \end{array} \quad \text{same!}$$

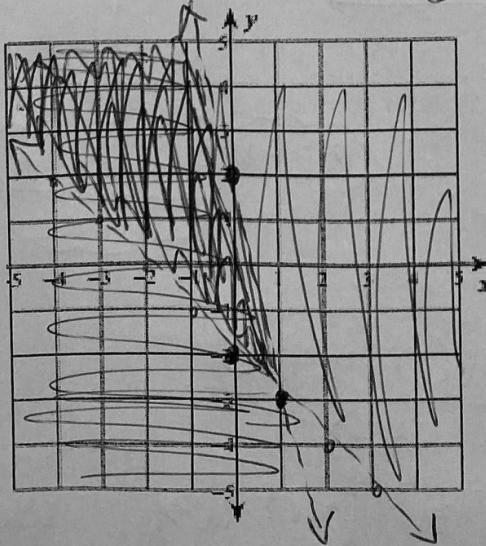
many solutions

7. Graph the systems of inequalities

$$y > -x - 2$$

$$y < -5x + 2$$

dotted lines!
shaded!



$$\begin{array}{r} 4 \\ 3y + 2(-1) = -2 \\ 3y - 2 = -2 \\ 3y = 0 \\ y = 0 \end{array}$$

$$\begin{array}{r} 5 \\ x + 2(0) - (-1) = 3 \\ x + 0 + 1 = 3 \\ x = 2 \end{array}$$

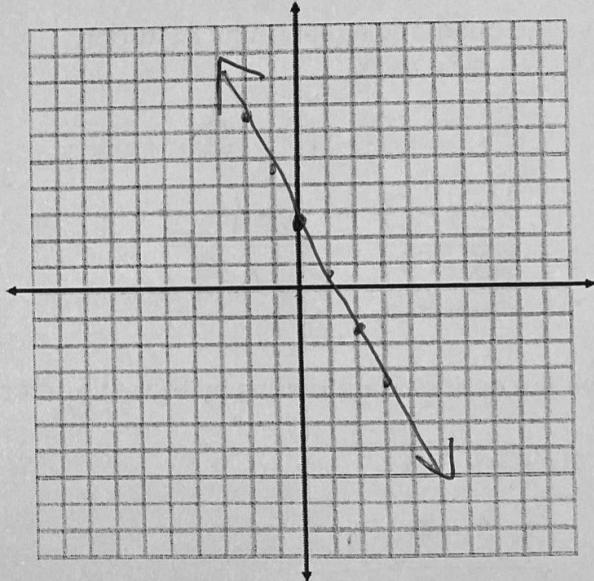
(2, 0, -1)

$$\begin{array}{r} 5 \\ -2(x - 2y + 3z = -9) \\ 2x + 5y + z = 10 \\ 3x - 6y + 9z = 12 \end{array}$$

$$\begin{array}{r} 1+2: \\ -2x + 4y - 10z = 18 \\ 2x + 5y + z = 10 \\ \hline 9y - 5z = 28 \end{array}$$

$$\begin{array}{r} 2+3: \\ -3x + 6y - 9z = 27 \\ 3x - 6y + 9z = 12 \\ \hline 0 = 39 \end{array}$$

no solution



Chapter 4: Quadratic Functions and Factoring

Factor the following quadratics completely. Don't forget about the greatest common factor.

1. $x^2 - 6x - 16$

$$(x-8)(x+2)$$

3. $x^2 + 8x + 16$

$$(x+4)(x+4)$$

2. $9x^2 + 15x + 6$

$$3(3x^2 + 5x + 2)$$

$$3(x^2 + 5x + 6)$$

$$3\left(\frac{x+2}{3}\right)\left(\frac{x+3}{3}\right)$$

4. $5x^2 - 125$

$$5(x^2 - 25)$$

$$5(x+5)(x-5)$$

Solve the quadratic equation by Factoring

5. $x^2 - 8x + 7 = 0$

$$(x-7)(x-1) = 0$$

$$x-7=0$$

$$\boxed{x=7}$$

$$x-1=0$$

$$\boxed{x=1}$$

6. $3x^2 + 5x = -2$

$$3x^2 + 5x + 2 = 0$$

$$x^2 + \frac{5}{3}x + \frac{2}{3} = 0$$

$$\left(\frac{x+2}{3}\right)\left(\frac{x+3}{3}\right) = 0$$

$$(3x+2)(x+1) = 0$$

$$3x+2=0$$

$$3x=-2$$

$$\boxed{x=\frac{-2}{3}}$$

$$x+1=0$$

$$\boxed{x=-1}$$

Solve the quadratic equations by the square root method.

7. $x^2 - 6 = 44$

$$\begin{aligned} x^2 &= 50 \\ x &= \pm\sqrt{50} \end{aligned}$$

8. $(x-5)^2 = -100$

$$x-5 = \pm 10i$$

$$\boxed{x = 5 \pm 10i}$$

Find the discriminant of the quadratic equation, give the number and type of solutions of the equation. Then solve using the quadratic formula

9. $-x^2 = 6x - 2$

$$0 = x^2 + 6x - 2$$

$$a=1 \quad b=6 \quad c=-2$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\boxed{x = \frac{-6 \pm \sqrt{44}}{2}} \rightarrow 2 \text{ real solutions}$$

$$b^2 - 4ac$$

10. $4x^2 + 7x + 5 = 0$

$$a=4 \quad b=7 \quad c=5$$

$$x = \frac{-7 \pm \sqrt{(7)^2 - 4(4)(5)}}{2(4)}$$

$$x = \frac{-7 \pm \sqrt{-31}}{8} = \frac{-7 \pm i\sqrt{31}}{8}$$

2 imaginary solutions

1. Graph the quadratic function: $y = -2x^2 - 4x + 1$
 VERTEX = (-1, 3) Max or Min

AXIS OF SYMMETRY = $x = -1$

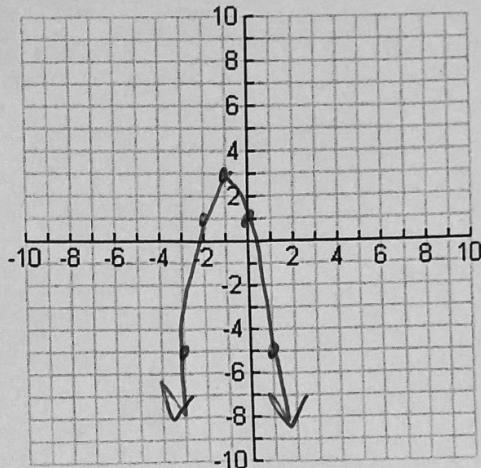
Y intercept = (0, 1)

DOMAIN = \mathbb{R}

RANGE = $y \leq 3$

$$x = \frac{4}{2(-2)} = \frac{4}{-4} = -1$$

X	Y
-3	-5
-2	1
-1	3
0	1
1	-5



12. Graph the quadratic equation: $y = 2(x - 3)(x + 1)$

VERTEX = (1, -8) Max or Min

AXIS OF SYMMETRY = $x = 1$

Y intercept = (0, -6)

$$y = 2(1-3)(1+1)$$

$$y = 2(-2)(2)$$

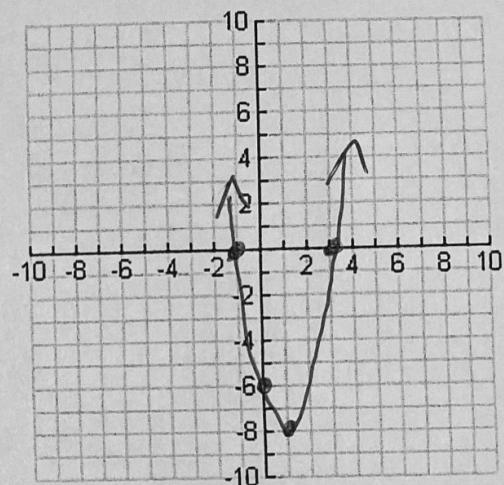
$$y = -8$$

DOMAIN = \mathbb{R}

$$y = 2(0-3)(0+1)$$

$$y = 2(-3)(1)$$

$$y = -6$$



13. Graph the quadratic function: $y = (x + 1)^2 - 3$

VERTEX = (-1, -3) Max or Min

AXIS OF SYMMETRY = $x = -1$

Y intercept = (0, -2)

X	Y
-3	1
-2	-2
-1	-3
0	-2
1	1

DOMAIN = \mathbb{R}

RANGE = $y \geq -3$

