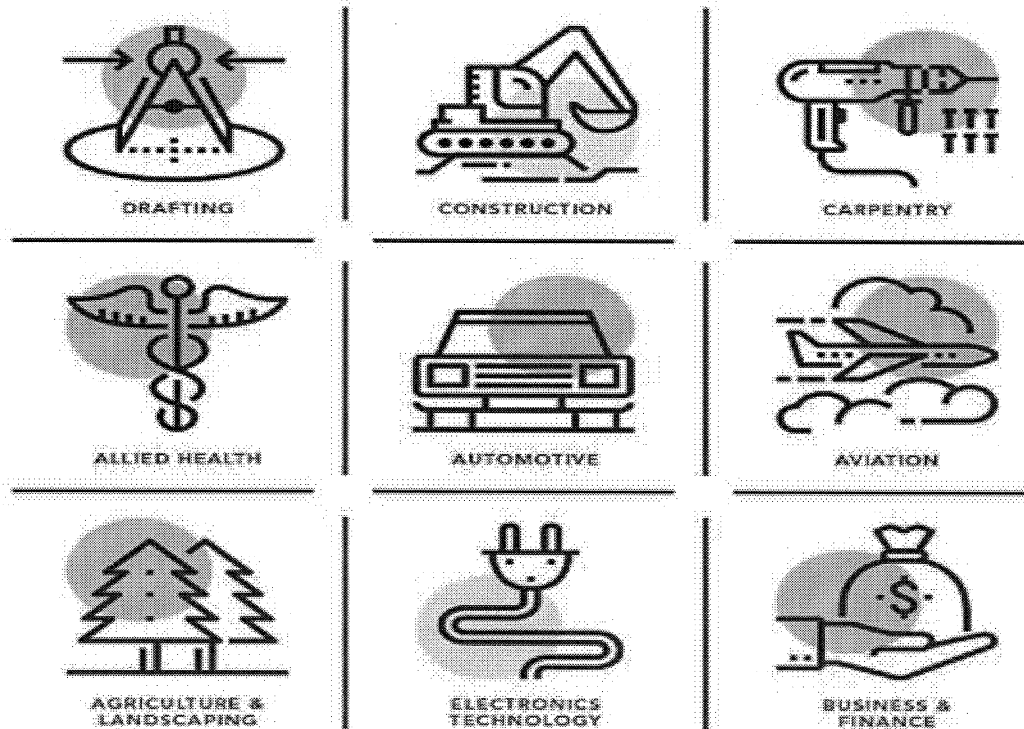


SUMMER PACKET PREPARING FOR MATHEMATICS & THE TRADES ALGEBRAIC & GEOMETRIC CONNECTIONS



SUFFIELD PUBLIC SCHOOLS

Supply List	Video/ App Resources	Pre-Requisites
<ul style="list-style-type: none"> Pencils Colored Pencils Graph Paper Graphing Calculator (TI 84 – Preferred)) 	<ul style="list-style-type: none"> https://www.khanacademy.org/ https://mathantics.com/ https://webmath.com/ https://www.mathplanet.com/ http://www.math.com/ https://www.ixl.com/math/algebra-1 https://www.wyzant.com https://purplemath.com 	<ul style="list-style-type: none"> Adding and Subtracting Polynomials Simplifying Algebraic Expressions using Properties of exponents. Solving Linear Equations Graphing Linear Functions Writing Equations of Lines Solving and Graphing Systems of Linear Equations Solving and Graphing Absolute Value Equations Factoring Solving Quadratic Equations Graphing Quadratic Functions

To Any student entering Algebraic and Geometric Connections or Mathematics for the Trades –

To ensure your success in these classes, you need to be proficient in working with percentages, ratios and proportions, as well as some of the foundational skills and concepts that you have learned over the course of Algebra 1 and Geometry. These skills will enable you to easily grasp the new concepts that will be covered in these courses, and apply them to solve mathematical and real-life problems. A strong foundation in these skills will also help you be successful in many standardized tests such as the SAT and ASVAB. We highly recommend that you take time to review and solidify your knowledge of these topics over the course of the summer.

Attached is a summer packet which has two parts. The first part focuses on practicing the basic mathematics skills of ratios, proportions and percentages. The second part has practice problems for several of the major topics that you have studied in Algebra 1 and Geometry. There are also links to on-line tutorials for these topics. Although the completion of the packet is not required, we strongly encourage you to take the time to work through the packet and use the resources that are provided for review when you do not remember how to solve a problem. You can certainly use other on-line resources that you can find for help, or ask relatives and/or friends for help. Please – remember this is an opportunity for you to review and make sure you are more prepared for your math class in the fall.

Learning Mathematics is like building a house; if your foundation is weak, you can't build high, and if there are gaps or floors that are not complete, the next floor is nearly impossible to build. **Our wish and hope for all our math students is not just to get by, but to excel in mathematics, and to ultimately enjoy and appreciate the beauty and power of mathematics** – a subject we love and hope we can get you excited to continue learning. We are providing you with resources to do as much preparation and solidification of the basic skills needed to engage with the course material fluently and confidently.

We wish you a happy summer, and hope you return in the fall with high expectations for yourself, the willingness to ask questions and reach out for help when you are struggling, and with the confidence that you can be successful.

PART 1

RATIOS, PROPORTIONS & PERCENTAGES

Ratios, Proportions and Percentages

Intro to Ratios

<https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-ratios-prop-topic/intro-to-ratios/v/ratios-intro>

<https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-ratios-prop-topic/cc-6th-equivalent-ratios/v/understanding-equivalent-ratios>

Solving Proportions

<https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-ratio-proportion/cc-7th-write-and-solve-proportions/v/find-an-unknown-in-a-proportion>

<https://www.youtube.com/watch?v=GO5ajwbFqVQ>

Working with Percents

<https://www.youtube.com/watch?v=WYWPuG-8U5Q>

<https://www.khanacademy.org/math/cc-sixth-grade-math/x0267d782:cc-6th-rates-and-percentages/cc-6th-percent-problems/v/finding-percentages-example>

Complete the Table

Decimal	Fraction	Percent
0.18	$\frac{18}{100} = \frac{9}{50}$	18%
0.28	$\frac{28}{100} = \frac{7}{25}$	28%
0.78	$\frac{78}{100} = \frac{39}{50}$	78%
0.96	$\frac{96}{100} = \frac{24}{25}$	96%
0.50	$\frac{50}{100} = \frac{1}{2}$	50%
0.30	$\frac{3}{10}$	30%
0.40	$\frac{2}{5}$	40%
0.25	$\frac{1}{4}$	25%
0.55	$\frac{11}{20}$	55%
0.125	$\frac{1}{8}$	12.5%
0.35	$\frac{35}{100} = \frac{7}{20}$	35%
0.75	$\frac{75}{100} = \frac{3}{4}$	75%
0.8	$\frac{80}{100} = \frac{4}{5}$	80%
0.04	$\frac{4}{100} = \frac{1}{25}$	4%
0.65	$\frac{65}{100} = \frac{13}{20}$	65%

Solve the following problems involving percentages. Round to the nearest hundredth when necessary.

2. What is 40% of 120? $\frac{40}{100} \times \frac{120}{1} = 48$

3. What is 60% of 70? $\frac{60}{100} \times \frac{70}{1} = 42$

4. What is 30% of 250? $\frac{30}{100} \times \frac{250}{1} = 75$

5. What is 12.5% of 480? $0.125 \times 480 = 60$

6. What is 230% of 18? $\frac{230}{100} \times \frac{18}{1} = \frac{4140}{100} = 41.4$

7. 70 is 60% of what number? $70 = \frac{60}{100} \times \rightarrow X = \frac{7000}{60} \rightarrow X = \frac{350}{3}$ or 116.6

8. 55 is 40% of what number? $55 = \frac{4}{100} \times \rightarrow X = \frac{5500}{4} \rightarrow X = 1375$

9. What percent is 24 of 80? $\frac{24}{80} \times \frac{100}{1} \rightarrow \frac{2400}{80} = 30\%$

10. What percent is 160 of 50? $\frac{160}{50} \times \frac{100}{1} \rightarrow \frac{16000}{50} = 320\%$

11. 30% of what number is 21.3? $\frac{30}{100} \times X = 21.3 \rightarrow 30X = 2130 \quad X = 71$

12. 75% of what number is 240? $\frac{75}{100} \times X = 240 \rightarrow 75X = 24000$
 $X = 320$

Solve each of the following proportions:

1. $\frac{2}{3} = \frac{a}{2}$

$$\begin{aligned} 2(2) &= 3(a) \\ 4 &= 3a \end{aligned}$$

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

2. $\frac{4}{6x} = \frac{3}{4}$

$$\begin{aligned} 4(4) &= 3(6x) \\ 16 &= 18x \end{aligned}$$

$$x = \frac{16}{18}$$

$$x = \frac{8}{9}$$

3. $\frac{4}{2} = \frac{8}{a}$

$$\begin{aligned} 4a &= 2(8) \\ 4a &= 16 \end{aligned}$$

$$a = 4$$

4. $\frac{x-4}{9} = \frac{6}{3}$

$$\begin{aligned} 3(x-4) &= 6(9) \\ 3x-12 &= 54 \end{aligned}$$

$$\begin{aligned} 3x &= 66 \\ x &= 22 \end{aligned}$$

5. $\frac{4}{10} = \frac{2}{m+3}$

$$\begin{aligned} 4(m+3) &= 2(10) \\ 4m+12 &= 20 \end{aligned}$$

$$\begin{aligned} 4m &= 8 \\ m &= 2 \end{aligned}$$

6. $\frac{n}{9} = \frac{n-1}{10}$

$$\begin{aligned} 10n &= 9(n-1) \\ 10n &= 9n-9 \end{aligned}$$

$$n = -9$$

7. $\frac{10}{7} = \frac{m-9}{m-4}$

$$10(m-4) = 7(m-9)$$

$$10m-40 = 7m-63$$

$$3m = -23$$

$$m = \frac{-23}{3} \text{ or } -7.\overline{66}$$

8. $\frac{2x+3}{5} = \frac{3x}{2}$

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

$$4x+6 = 15x$$

$$6 = 11x$$

$$x = \frac{6}{11}$$

Solve the following word problems involving proportions:

1. If 3 out of 5 students eat school lunch, then how many students would be expected to eat school lunch at a school with 750 students?

$$\frac{3}{5} = \frac{x}{750} \quad 5x = 3(750) \quad x = 450 \text{ students eat lunch}$$

2. In a survey, it was found that 4 out of 10 people have a pair of sunglasses. How many people would you expect to have a pair of sunglasses in a group of 45 people?

$$\frac{4}{10} = \frac{x}{45} \quad 10x = 4(45) \quad 10x = 180 \quad x = 18 \text{ people will have sunglasses}$$

3. Data collected at a local mall indicated that 7 out of 20 men observed were wearing a hat. How many would you expect to have been wearing hats if 7500 men were at the mall?

$$\frac{7}{20} = \frac{x}{7500} \quad 7(7500) = 20x \quad 52500 = 20x \quad x = 2625 \text{ men will have a hat}$$

4. Women today account for 17% of the jockeys in Australia. If there are 75 jockeys at the racetrack on a particular day, how many would you expect to be women?

$$\frac{17}{100} = \frac{x}{75} \quad 17(75) = 100x \quad 1275 = 100x \quad x = 12.75 \quad 12 \text{ jockeys will be women}$$

5. A horse that is 14 hands tall weighs 850 pounds. What would a horse that is 16 hands tall be expected to weigh?

$$\frac{14}{850 \text{ lbs}} = \frac{16}{x} \quad 14x = 850 \times 16 \quad 14x = 13600 \quad x = 971.43 \text{ pounds}$$

6. Children's Advil suggests that a child receive 0.625 mL of medicine per 10 pounds of weight. How much medicine should a child weighing 45 pounds receive?

$$\frac{0.625}{10 \text{ lbs}} = \frac{x}{45 \text{ lbs}} \quad 0.625 \times 45 = 10x \quad 28.13 = 10x \quad x = 2.813 \text{ mL}$$

7. A subscription to a streaming service costs \$6 per month. How much will the service cost for 2 years?

$$\frac{\$6}{1 \text{ mo.}} = \frac{x}{24 \text{ mo.}} \quad 6(24) = 1x \quad \$144 \text{ for 2 years or 24 mos}$$

8. Suffield's top runner can run 3200 meters in 9 minutes and 22 seconds.

How long will it take him to run 5000 meters ?

$$\frac{3200 \text{ m}}{562 \text{ sec}} = \frac{5000 \text{ m}}{X} \rightarrow \frac{562(5000)}{3200} = X \quad X = 878.13 \text{ seconds}$$

$$X = 14 \text{ mins } 38.13 \text{ sec}$$

9. A company that produces flags needed to make 5000 flags for a 4th of July celebration. If it took 40 hours to make the flags, how long would you expect it to take to make 10 flags ?

$$\frac{5000 \text{ flags}}{40 \text{ hours}} = \frac{10 \text{ flags}}{X} \quad 40(10) = 5000 X \quad X = 0.08 \text{ hrs}$$

$$\frac{400}{5000} = X \quad X = 4.8 \text{ mins}$$

10. 2L of Acid is mixed with 5 Liters of Water to produce a solution used at a chemical plant. If the plant needs 350 Liters of the solution, How much acid will be needed ?

$$\frac{2 \text{ L acid}}{7 \text{ L of Soln.}} = \frac{X}{350 \text{ L}}$$

$$7X = 2(350)$$

$$7X = 700$$

$$X = 100$$

100 Liters of Acid

PART 2
ALGEBRA & GEOMETRY REVIEW

A. Simplifying Polynomial Expressions

Objectives: The Student will be able to –

- Apply the appropriate arithmetic operations and algebraic properties needed to simplify an algebraic expression.
- Simplify polynomial expressions using addition and subtraction

Simplify:

1. $8x - 9y + 16x + 12y$ $24x + 3y$

2. $14y + 22 - 15y^2 + 23y$ $-15y^2 + 37y + 22$

3. $5n - (3 - 4n)$ $9n - 3$

4. $-2(11x - 3)$ $-22x + 6$

5. $3(8z - 4w) + 2(10z - 6w)$ $44z - 24w$

6. $5(3x - 4) - 2(4x - 6)$ $7x - 8$

Simplifying Polynomials:

<https://www.youtube.com/watch?v=ZvL9aDGNHqA>

<https://www.khanacademy.org/math/algebra-home/alg-polynomials/alg-introduction-to-polynomials/v/simplify-a-polynomial>

<https://www.youtube.com/watch?v=ZvL9aDGNHqA>

B. Solving Linear Equations

Objectives: The Student will be able to –

- Solve one and two step equations.
- Solve equations with variables on both sides.
- Solve Multi-step equations that need to be simplified first
- Solve Literal Equations for a specific variable.

Solve each equation. You must show all work.

1. $5x - 2 = 33$ $x = 7$

2. $140 = 4x + 36$ $x = 26$

3. $8(3x - 4) = 196$ $x = \frac{19}{2}$ or 9.5

4. $45x - 720 + 15x = 60$ $x = 13$

5. $132 = 4(12x - 9)$ $x = \frac{7}{2}$ or 3.5

6. $154 + 7x - 68 = 198$ $x = 16$

7. $-5(3x - 8) + 6x = -131$ $x = 19$

8. $-7x - 10 = 18 + 3x$ $x = -\frac{14}{5}$ or -2.8

9. $12x + 8 - 15 = -2(3x - 82)$ $x = \frac{19}{2}$

10. $-(12x - 6) = 2x - 14$ $x = 10/7$

Solving Linear Equations (One Step):

<https://www.khanacademy.org/math/algebra-home/alg-basic-eq-ineq/alg-old-school-equations/v/algebra-linear-equations-1>

Solving Linear Equations (Two Step):

<https://www.khanacademy.org/math/algebra-home/alg-basic-eq-ineq/alg-old-school-equations/v/algebra-linear-equations-2>

Solving Linear Equations (Multi - Step):

<https://www.khanacademy.org/math/algebra-home/alg-basic-eq-ineq/alg-old-school-equations/v/algebra-linear-equations-3>

<https://www.khanacademy.org/math/algebra-home/alg-basic-eq-ineq/alg-old-school-equations/v/algebra-linear-equations-4>

Solve the Literal Equations for the indicated variable.

11. $Y + M = Z$, for M

$$M = Z - Y$$

12. $2x - 3y = 9$, for y

$$y = \frac{9 - 2x}{-3}$$
$$y = -3 + \frac{2}{3}x$$

13. $2xy + w = 10$, for x

$$x = \frac{10 - w}{2y}$$

14. $4x + y - 5h = 10y + k$, for x

$$x = \frac{9y + k + 5h}{4}$$

Solving Literal Equations:

<https://www.khanacademy.org/math/algebra-home/alg-basic-eq-ineq/alg-old-school-equations/v/solving-for-a-variable>

<https://www.youtube.com/watch?v=gqSfw2gmMsg>

C. Solving Absolute Value Equations

Objectives: The Student will be able to –

- Solve absolute value equations.

1. $|2x| = 12$

2. $|3x + 4| = 8$

3. $2|3x - 2| + 5 = 15$

4. $|5x + 2| = -7$

Solving Absolute Value Equations:

<https://www.youtube.com/watch?v=CHbhZQVd7Y>

<https://www.khanacademy.org/math/algebra-home/alg-absolute-value/alg-absolute-value-equations/v/absolute-value-equations>

1. $|2x| = 12$

$2x = 12$

$2x = -12$

$x = 6$

$x = -6$

2. $|3x + 4| = 8$

$3x + 4 = 8$

$3x = 4$

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

$3x + 4 = -8$

$3x = -12$

$x = -4$

3. $2|3x - 2| + 5 = 15$

$2|3x - 2| = 10$

$|3x - 2| = 5$

$3x - 2 = 5$

$3x = 7$

$x = \frac{7}{3}$

$3x - 2 = -5$

$3x = -3$

$x = -1$

4. $|5x + 2| = -7$

\emptyset

D. Properties of Exponents

Objectives: The Student will be able to –

- Simplify expressions using the properties of exponents

Simplify each expression. Express answers with positive exponents.

$$1. x^5 \cdot x \cdot x^2 = x^8$$

$$2. \frac{m^{15}}{m^3} = m^{12}$$

$$3. (k^4)^5 = k^{20}$$

$$4. y^0 = 1$$

$$5. (p^4 n^2) \cdot (p^7 n^5) = p^{11} n^7$$

$$6. \frac{45y^3 z^{10}}{5y^3 z} = 9z^9$$

$$7. (4h^5 k^3) \cdot (15h^3 k^2) = 60h^8 k^5$$

$$8. \frac{12a^4 b^6}{36ab^2 c} = \frac{a^3 b^4}{3c}$$

$$9. (3m^2 y)^3 = 27m^6 y^3$$

$$10. (3x^4 y^2)^2 \cdot (2x^3 y^5 m^3)^2 = 36x^{14} y^{14} m^6$$

$$11. 4x^2 (3x^5 y^2)^0 = 4x^2$$

Properties of Exponents:

<https://www.youtube.com/watch?v=tePk4uUBrsU>

<https://www.youtube.com/watch?v=etMK3xViMAc>

<https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-exponent-properties/v/exponent-properties-involving-products>

E. Slopes of Lines & Equations of Lines

Objectives: The Student will be able to –

- Identify and calculate the slope of a line.
- Write the equation of a line in Point-Slope Form.
- Write the equation of a line in Slope-Intercept Form.
- Write the equation of a line in Standard Form.
- Write the equations of parallel and perpendicular lines.

Calculate the Slopes of the lines with following pairs of points.

1. $(-1, 4)$ and $(1, -2)$

2. $(3, 5)$ and $(-3, 1)$

3. $(2, 5)$ and $(5, 10)$

4. $(2, -5)$ and $(-4, -5)$

5. $(3, -2)$ and $(3, 7)$

Slopes:

<https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:linear-equations-graphs/x2f8bb11595b61c86:slope/v/slope-of-a-line-2>

https://www.youtube.com/watch?v=ld_UqMLAXzY

$$\begin{aligned} \textcircled{1} \quad & \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-2 - 4}{1 - (-1)} = \frac{-6}{2} \\ &= -3 \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad & \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{1 - 5}{-3 - 3} \\ &= \frac{-4}{-6} \\ &= \frac{2}{3} \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad & \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{10 - 5}{5 - 2} \\ &= \frac{5}{3} \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad & \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-5 - (-5)}{-4 - 2} \\ &= \frac{0}{-6} \\ &= 0 \end{aligned}$$

$$\begin{aligned} \textcircled{5} \quad & \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{7 - (-2)}{3 - 3} \\ &= \frac{9}{0} \\ &= \text{undefined.} \end{aligned}$$

Write the equation of the lines with given slope and a point on the line.

Write the equations of the lines in:

(a) Point - Slope Form.

(b) Slope - Intercept Form

(c) Standard Form

1. Slope = -3 Point : $(2,3)$

2. Slope = 5 Point : $(-2,4)$

3. Slope = $\frac{2}{3}$ Point : $(3,-5)$

① $y-3 = -3(x-2)$

b) $y = -3x + 9$

c) $3x + y = 9$

② $y-4 = 5(x+2)$

b) $y = 5x + 14$

c) $-5x + y = 14$

③ $y+5 = \frac{2}{3}(x-3)$

b) $y = \frac{2}{3}x - 7$

c) $-2x + 3y = -2$

Write the equation of the lines through the given points on the line.

Write the equations of the lines in:

(a) Point - Slope Form.

(b) Slope - Intercept Form

(c) Standard Form

1. Points : $(2,-3)$ and : $(5,-12)$

2. Points : $(-4,-5)$ and : $(2,19)$

3. Points : $(5,-1)$ and : $(10,2)$

① slope = $\frac{y_2 - y_1}{x_2 - x_1}$ a) $y+3 = -3(x-2)$

= $\frac{-12 - (-3)}{5 - 2}$

= $-\frac{9}{3}$

= -3

or

$y+12 = -3(x-5)$

b) $y = -3x + 3$

c) $3x + y = 3$

② slope = $\frac{y_2 - y_1}{x_2 - x_1}$ a) $y+5 = 4(x+4)$

= $\frac{19 - (-5)}{2 - (-4)}$

= $\frac{24}{6} = 4$

or

$y-19 = 4(x-2)$

b) $y = 4x + 11$

c) $-4x + y = 11$

③ slope = $\frac{y_2 - y_1}{x_2 - x_1}$

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

= $\frac{3}{5}$

a) $y+1 = \frac{3}{5}(x-5)$

or $y-2 = \frac{3}{5}(x-10)$

b) $y = \frac{3}{5}x - 4$

c) $-3x + 5y = -20$

Equations of Lines:

<https://www.youtube.com/watch?v=lzqTDOJWwhY>

<https://www.youtube.com/watch?v=xlzDjC11udE>

<https://www.youtube.com/watch?v=4u7MZvFqFJo>

4. Rewrite the equation into Slope-Intercept Form : $8x - 2y = 24$.
Identify the slope and y-intercept.
5. Rewrite the equation into Slope-Intercept Form : $3x + 5y = 30$.
Identify the slope and y-intercept.
6. Write the equation of the line through the point $(3, 8)$
and parallel to the line $6x + 3y = 30$.
7. Write the equation of the line through the point $(-4, 5)$
and perpendicular to the line $3x - 9y = 18$.

Equations of Parallel and Perpendicular Lines:

<https://www.youtube.com/watch?v=LTb2-LE7StE>

<https://www.khanacademy.org/math/geometry/hs-geo-analytic-geometry/hs-geo-parallel-perpendicular-eq/v/perpendicular-lines-2>

$$\begin{aligned} \textcircled{4} \quad 8x - 2y &= 24 & \text{slope} &= 4 \\ -2y &= -8x + 24 & y\text{-int} &= (0, -12) \\ y &= 4x - 12 \end{aligned}$$

$$\begin{aligned} \textcircled{5} \quad 3x + 5y &= 30 & \text{slope} &= -3/5 \\ 5y &= -3x + 30 & y\text{-int} &= (0, 6) \\ y &= -\frac{3}{5}x + 6 \end{aligned}$$

$$\begin{aligned} \textcircled{6} \quad 6x + 3y &= 30 & \text{slope} &= -2 \\ 3y &= -6x + 30 & \Rightarrow \text{slope} &= -2 \\ y &= -2x + 10 & \text{Point} &= (3, 8) \end{aligned}$$

Parallel lines have same slope

Point-Slope Form

$$y - 8 = -2(x - 3)$$

$$\begin{aligned} \textcircled{7} \quad 3x - 9y &= 18 & \text{slope} &= \frac{1}{3} \Rightarrow \text{slope} = -3 \\ -9y &= -3x + 18 & \text{Point} &= (-4, 5) \\ y &= \frac{1}{3}x - 2 & y - 5 &= -3(x + 4) \end{aligned}$$

Perpendicular lines have slopes that are opposite reciprocals

F. Graphing Linear Functions

Objectives: The Student will be able to –

- Graph lines given in Slope – Intercept form.
- Graph lines given in Point – Slope form.
- Graph lines given in Standard Form.
- Identify the equation of a line from its graph.

Graphing Linear Functions:

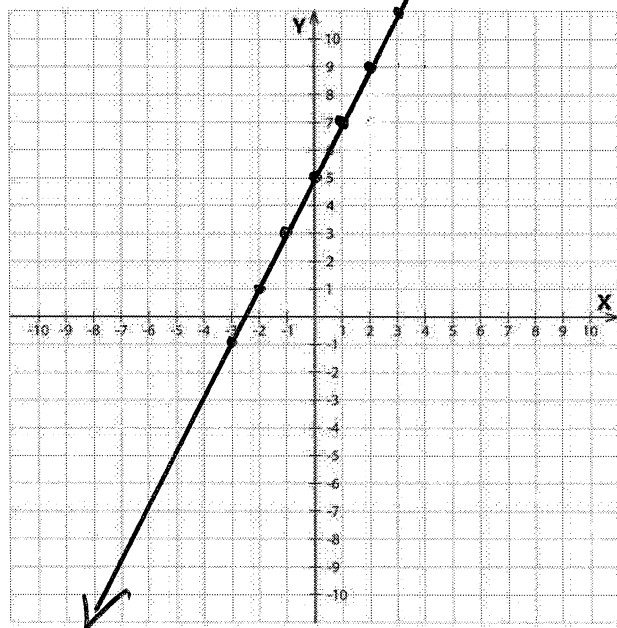
<https://www.youtube.com/watch?v=zihUOJgDkv0>

<https://www.khanacademy.org/math/in-in-grade-9-ncert/xfd53e0255cd302f8:linear-equations-in-two-variables/xfd53e0255cd302f8:graph-of-a-linear-equation-in-two-variables/v/graphs-of-linear-equations>

https://www.youtube.com/watch?v=UgtMbCl4G_I

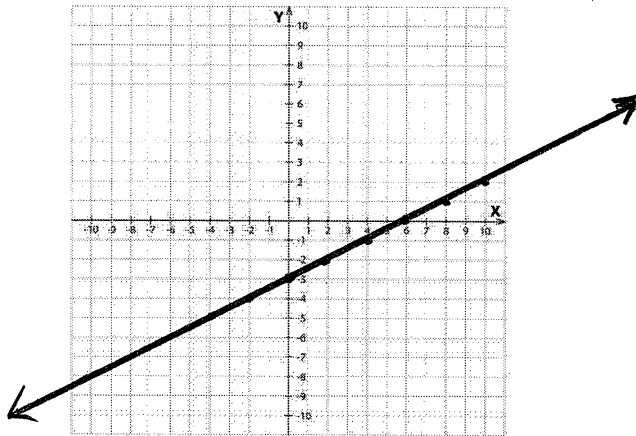
1. Graph the line : $y = 2x + 5$

Slope = 2 Y-intercept = (0, 5)



2. Graph the line : $y = \frac{1}{2}x - 3$

Slope = $\frac{1}{2}$ Y-intercept = $(0, -3)$



y-int $(0, -3)$

x-int (y=0)

$$0 = \frac{1}{2}x - 3$$

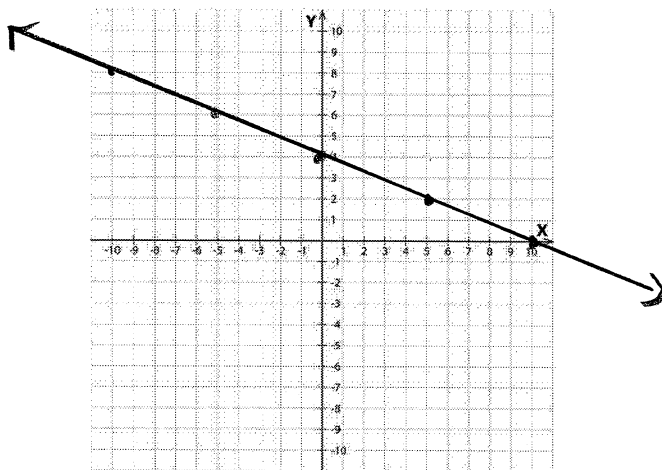
$$3 = \frac{1}{2}x$$

$$6 = x$$

$(6, 0)$

3. Graph the line : $y = -\frac{2}{5}x + 4$

Slope = $-\frac{2}{5}$ Y-intercept = $(0, 4)$



y-int: $(0, 4)$

x-int (y=0)

$$0 = -\frac{2}{5}x + 4$$

$$-4 = -\frac{2}{5}x$$

$$-20 = -2x$$

$$10 = x$$

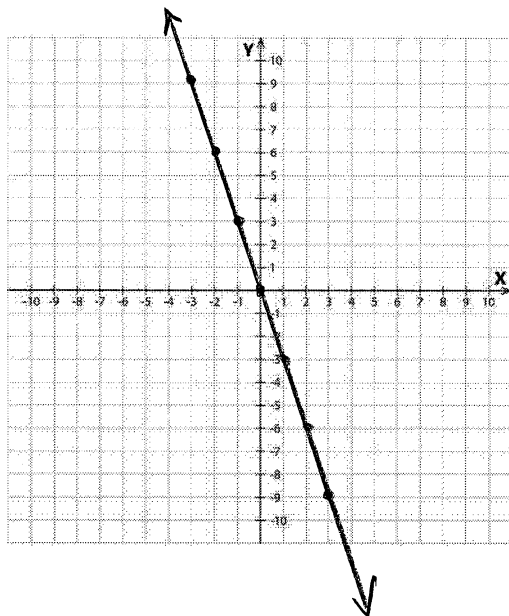
$(10, 0)$

4. Graph the line : $y = -3x$

Slope = -3 Y-intercept = (0,0)

y-int (0,0)

x-int (0,0)



5. Graph the line : $3x + y = 3$

X-intercept = (1,0) Y-intercept = (0,3)

y-int (x=0)

$$3x + y = 3$$

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

$$y = 3$$

$$(0,3)$$

x-int (y=0)

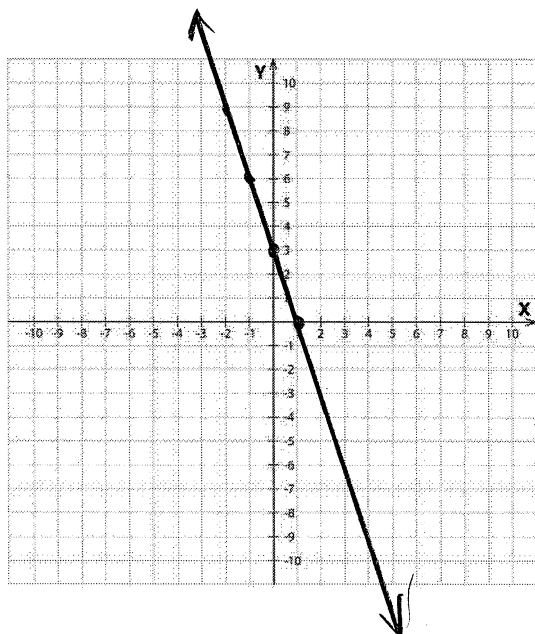
$$3x + y = 3$$

$$3x + 0 = 3$$

$$3x = 3$$

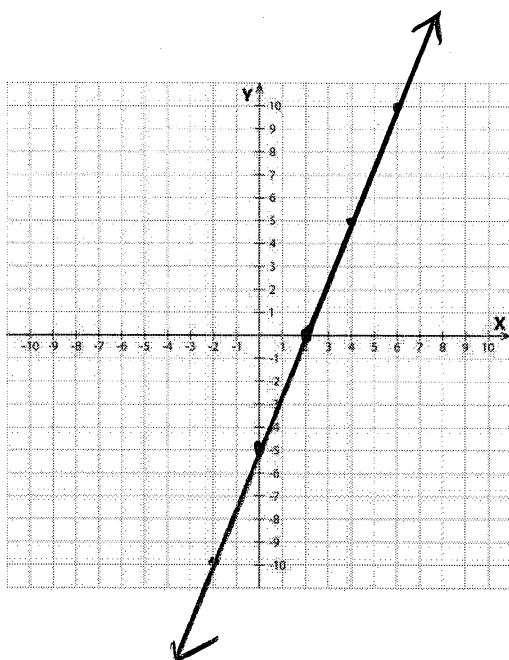
$$x = 1$$

$$(1,0)$$



6. Graph the line : $5x - 2y = 10$

X-intercept = $(2, 0)$ Y-intercept = $(0, -5)$

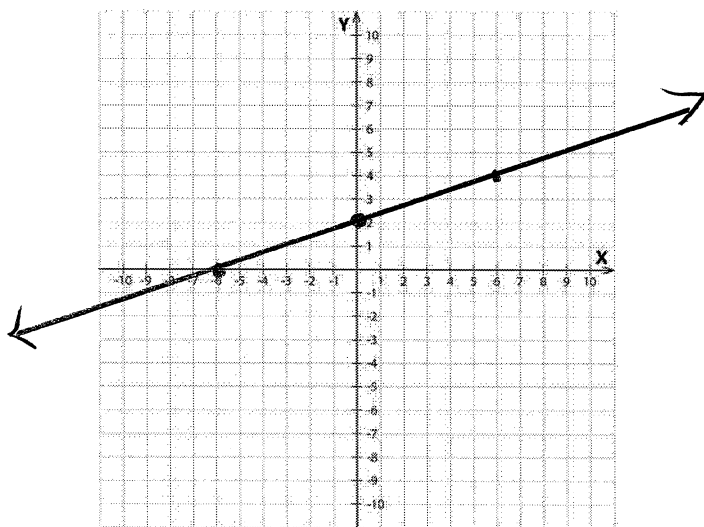


$$\begin{aligned} \text{x-int (y=0)} \\ 5x - 2y &= 10 \\ 5x - 2(0) &= 10 \\ 5x &= 10 \\ x &= 2 \\ (2, 0) \end{aligned}$$

$$\begin{aligned} \text{y-int (x=0)} \\ 5x - 2y &= 10 \\ 5(0) - 2y &= 10 \\ -2y &= 10 \\ y &= -5 \\ (0, -5) \end{aligned}$$

7. Graph the line : $-2x + 6y = 12$

X-intercept = _____ Y-intercept = _____



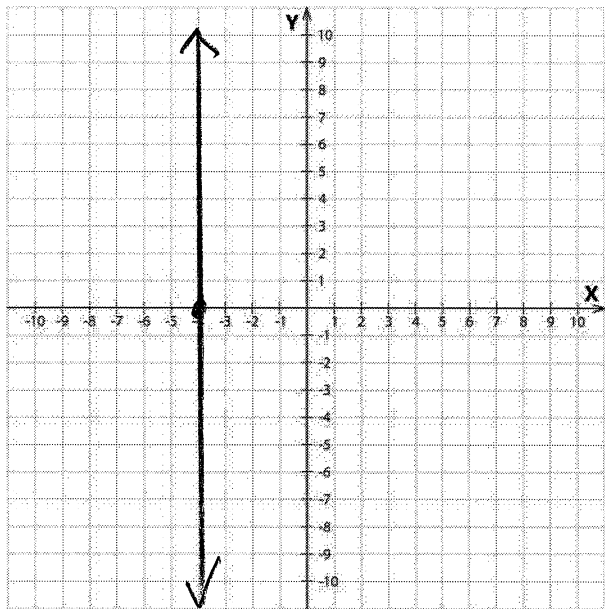
$$\begin{aligned} \text{x-int (y=0)} \\ -2x + 6y &= 12 \\ -2x + 6(0) &= 12 \\ -2x &= 12 \\ x &= -6 \\ (-6, 0) \end{aligned}$$

$$\begin{aligned} \text{y-int (x=0)} \\ -2x + 6y &= 12 \\ -2(0) + 6y &= 12 \\ 6y &= 12 \\ y &= 2 \\ (0, 2) \end{aligned}$$

8. Graph the line : $x = -4$

X-intercept = $(-4, 0)$ Y-intercept = \emptyset

$x = \text{constant} \rightarrow \text{Vertical Line}$



G. Graph Inequalities in two variables

Objectives: The Student will be able to –

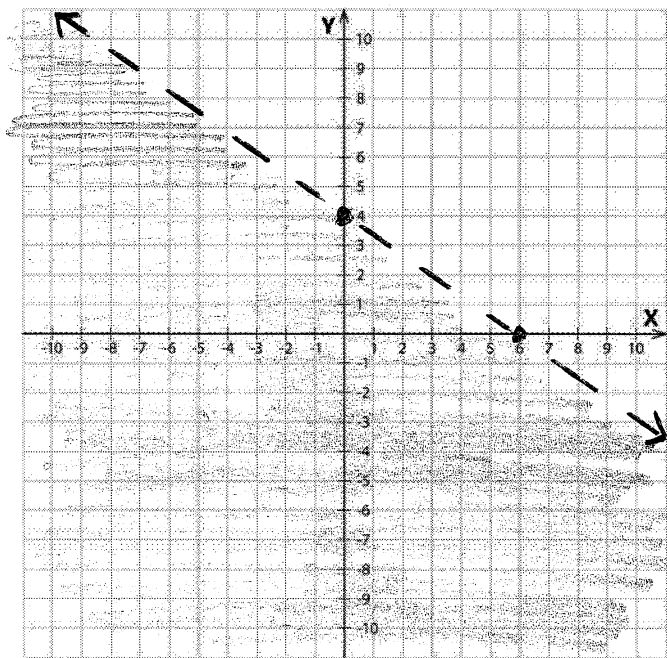
- Graph inequalities in two variables

Graphing Inequalities in two variables:

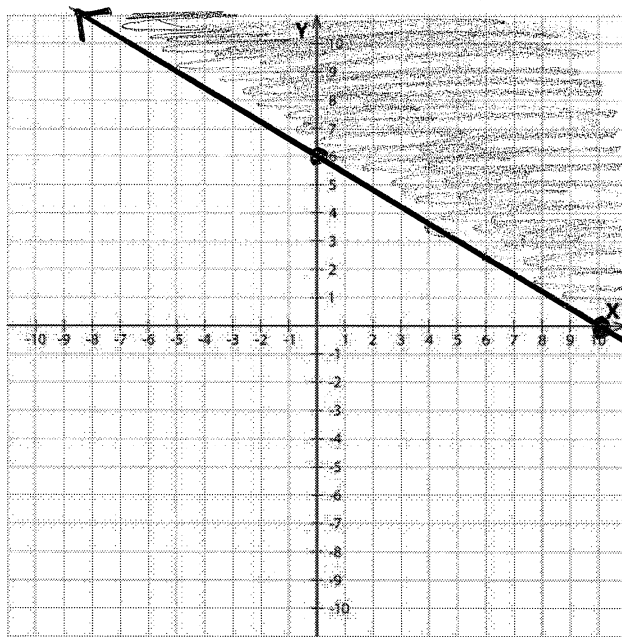
<https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:inequalities-systems-graphs/x2f8bb11595b61c86:graphing-two-variable-inequalities/v/graphing-linear-inequalities-in-two-variables-example-2>

1. Graph the inequality: $2x + 3y < 12$

$$\begin{aligned}x\text{-intercept} &= (6, 0) \\ y\text{-intercept} &= (0, 4)\end{aligned}$$

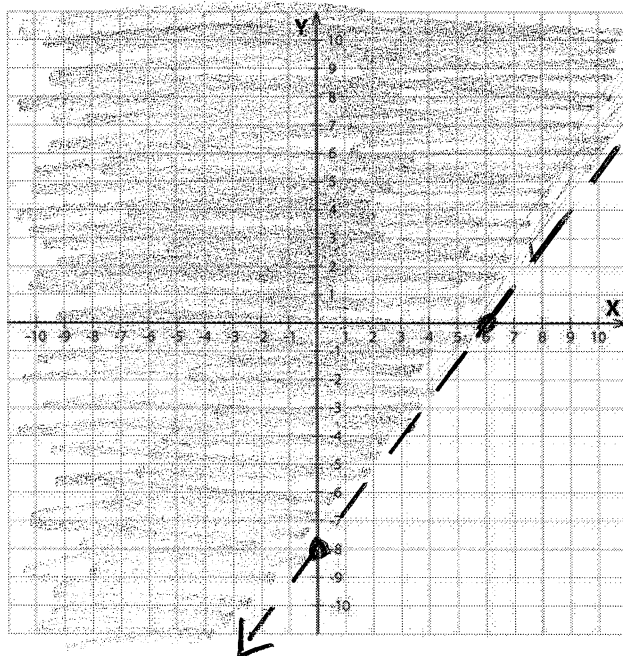


2. Graph the inequality : $3x + 5y \geq 30$



x-intercept (10, 0)
y-intercept (0, 6)

3. Graph the inequality : $4x - 3y < 24$



x-intercept (6, 0)
y-intercept (0, -8)

H. Solving Systems of Equations

Objectives: The Student will be able to –

- Solve systems of linear equations by graphing
- Solve systems of linear equations by elimination
- Solve systems of linear equations by substitution

Solving Systems by graphing:

<https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-systems-topic/cc-8th-systems-graphically/v/solving-linear-systems-by-graphing>

<https://www.youtube.com/watch?v=Pd4hwS8qHms>

Solving Systems by Elimination:

<https://www.khanacademy.org/math/algebra-home/alg-system-of-equations/alg-equivalent-systems-of-equations/v/solving-systems-of-equations-by-elimination>

<https://www.youtube.com/watch?v=HL2fDIOMLJ0>

Solving Systems by Substitution:

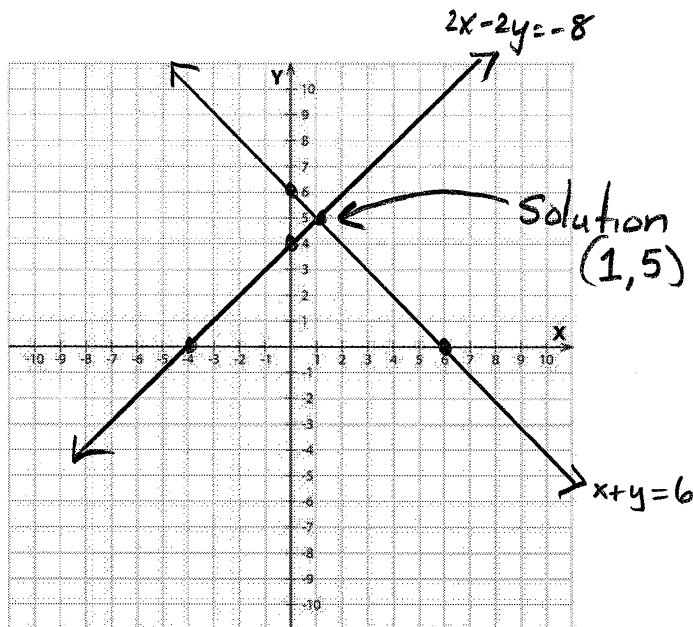
<https://www.khanacademy.org/math/algebra-home/alg-system-of-equations/alg-solving-systems-of-equations-with-substitution/v/solving-linear-systems-by-substitution>

<https://www.youtube.com/watch?v=cblHUeq3bkE>

1. Solve the system of equations by graphing:

$$x + y = 6$$

$$2x - 2y = -8$$



$$x + y = 6$$

$$x\text{-intercept } (6, 0)$$

$$y\text{-intercept } (0, 6)$$

$$2x - 2y = -8$$

$$x\text{-intercept } (-4, 0)$$

$$y\text{-intercept } (0, 4)$$

2. Solve the system of linear equations by elimination:

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

$$4x - 3y = 20$$

$$(2, -4)$$

$$\begin{array}{r} 3[3x + 2y = -2] \quad 9x + 6y = -6 \\ 2[4x - 3y = 20] \quad 8x - 6y = 40 \\ \hline 17x = 34 \end{array}$$

$$17x = 34$$

$$x = 2$$

3. Solve the system of linear equations by substitution:

$$5x - 3y = 2$$

$$y = 3x + 6$$

$$y = 3x + 6$$

$$5x - 3y = 2$$

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

$$5x - 9x - 18 = 2$$

$$-4x - 18 = 2$$

$$-4x = 20$$

$$x = -5$$

$$y = 3x + 6$$

$$y = 3(-5) + 6$$

$$y = -15 + 6$$

$$y = -9$$

$$(-5, -9)$$

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

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

$$6 + 2y = -2$$

$$2y = -8$$

$$y = -4$$

I. Solve Quadratic Equations

Objectives: The Student will be able to –

- Solve quadratic equations by using square roots.
- Solve quadratic equations by factoring.
- Solve quadratic equations by using the Quadratic Formula

Solve by using Square Roots:

1. $3x^2 = 9$

① $3x^2 = 9$
 $x^2 = 3$

2. $2x^2 - 9 = 15$

$x = \pm\sqrt{3}$

3. $(2x-5)^2 - 5 = 31$

② $2x^2 - 9 = 15$
 $2x^2 = 24$
 $x^2 = 12$
 $x = \pm\sqrt{12}$
 $x = \pm 2\sqrt{3}$

③ $(2x-5)^2 - 5 = 31$
 $(2x-5)^2 = 36$
 $2x-5 = \pm\sqrt{36}$
 $2x-5 = \pm 6$
 $2x-5 = 6$ $2x-5 = -6$
 $2x = 11$ $2x = -1$
 $x = \frac{11}{2}$ $x = -\frac{1}{2}$

Solving Quadratic Equations by Square Roots:

<https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:quadratic-functions-equations/x2f8bb11595b61c86:untitled-1082/v/simple-quadratic-equation>

Solve by Factoring:

1. $x^2 - 25 = 0$ $x = -5$
 $(x+5)(x-5) = 0$ $x = 5$

2. $x^2 - 8x + 15 = 0$ $x = 5$
 $(x-5)(x-3) = 0$ $x = 3$

3. $x^2 + 11x + 30 = 0$ $x = -5$
 $(x+5)(x+6) = 0$ $x = -6$

4. $x^2 - 3x - 40 = 0$ $x = 8$
 $(x-8)(x+5) = 0$ $x = -5$

5. $x^2 + 5x - 24 = 0$ $x = -8$
 $(x+8)(x-3) = 0$ $x = 3$

6. $3x^2 + 12x - 36 = 0$ $3(x+6)(x-2)$ $x = -6$
 $3(x^2 + 4x - 12) = 0$ $x = 2$

7. $6x^2 + x - 12 = 0$ $x = 4/3$
 $(3x-4)(2x+3) = 0$ $x = -3/2$

8. $x^2 + 9x - 12 = 3x + 4$ $x = -8$
 $x^2 + 6x - 16 = 0$ $x = 2$
 $(x+8)(x-2) = 0$

Solving Quadratic Equations by Factoring:

<https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:quadratic-functions-equations/x2f8bb11595b61c86:quadratics-solve-factoring/v/example-1-solving-a-quadratic-equation-by-factoring>

<https://www.youtube.com/watch?v=qeByhTF8WEw>

<https://www.youtube.com/watch?v=zc2CpyRtjvY>

Solve by using the Quadratic Formula:

1. $2x^2 + 6x + 3 = 0$

2. $3x^2 - 2x + 2 = 7$

3. $5x^2 - 4x + 2 = 4x^2 - 6x + 8$

Solving Quadratic Equations using the Quadratic Formula:

<https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:quadratic-functions-equations/x2f8bb11595b61c86:quadratic-formula-a1/v/using-the-quadratic-formula>

<https://www.youtube.com/watch?v=IINAJI36-10>

Quadratic Formula

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

① $2x^2 + 6x + 3 = 0$

$a = 2$

$b = 6$

$c = 3$

$$X = \frac{-6 \pm \sqrt{6^2 - 4(2)(3)}}{2(2)}$$

$$X = \frac{-6 \pm \sqrt{36 - 24}}{4}$$

$$X = \frac{-6 \pm \sqrt{12}}{4}$$

$$X = \frac{-6 \pm 2\sqrt{3}}{4}$$

$$X = \frac{-3 \pm \sqrt{3}}{2}$$

② $3x^2 - 2x + 2 = 7$

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

$a = 3$

$b = -2$

$c = -5$

$$X = \frac{2 \pm \sqrt{(-2)^2 - 4(3)(-5)}}{2(3)}$$

$$X = \frac{2 \pm \sqrt{4 - (-60)}}{6}$$

$$X = \frac{2 \pm \sqrt{64}}{6}$$

$$X = \frac{2 \pm 8}{6}$$

$$X = \frac{10}{6} \text{ or } \frac{-6}{6}$$

$$X = \frac{5}{3} \text{ or } -1$$

$$5x^2 - 4x + 2 = 4x^2 - 6x + 8$$

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

$a = 1$

$b = 2$

$c = -6$

$$X = \frac{-2 \pm \sqrt{2^2 - 4(1)(-6)}}{2(1)}$$

$$X = \frac{-2 \pm \sqrt{4 - (-24)}}{2}$$

$$X = \frac{-2 \pm \sqrt{28}}{2}$$

$$X = \frac{-2 \pm 2\sqrt{7}}{2}$$

$$X = -1 \pm \sqrt{7}$$

J. Graphing Quadratic Functions

Objectives: The Student will be able to –

- Graph quadratic functions given in vertex form.
- Graph quadratic functions given in standard form.
- Graph quadratic functions given in intercept form.
- Identify the intercepts of a quadratic function.
- Identify the vertex of a quadratic function
- Identify the axis of symmetry of a quadratic function
- Determine the concavity of a quadratic function.

Graphing Quadratic Functions:

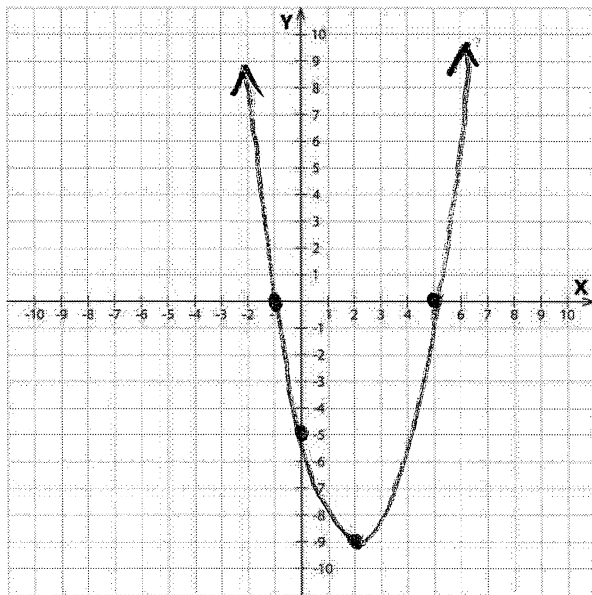
https://www.youtube.com/watch?v=Hq2Up_1h5E

https://www.youtube.com/watch?v=OHH7fX_M8Ns

<https://www.youtube.com/watch?v=y99INRqLjBA>

1. Graph : $f(x) = (x-2)^2 - 9$

Identify all key points : Intercepts, Vertex, Axis of Symmetry.



Vertex: $(2, -9)$

Concave up

y-int ($x=0$)

$$y = (x-2)^2 - 9$$

$$y = (-2)^2 - 9$$

$$y = 4 - 9$$

$$y = -5$$

$$(0, -5)$$

x-ints ($y=0$)

$$0 = (x-2)^2 - 9$$

$$9 = (x-2)^2$$

$$\pm 3 = x-2$$

$$x-2 = 3$$

$$x = 5$$

$$(5, 0)$$

$$x-2 = -3$$

$$x = -1$$

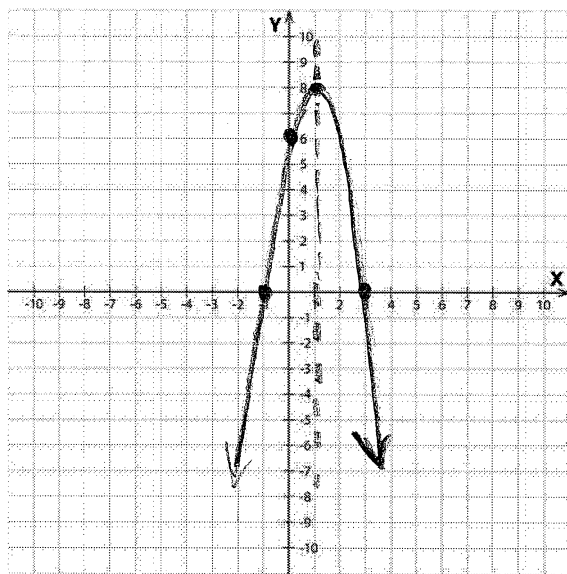
$$(-1, 0)$$

Axis of Symmetry

$$x = 2$$

2. Graph: $f(x) = -2(x-1)^2 + 8$

Identify all key points : Intercepts, Vertex, Axis of Symmetry.



Vertex: $(1, 8)$

Concave down

y-int ($x=0$)

$$y = -2(0-1)^2 + 8$$

$$y = -2(-1)^2 + 8$$

$$y = -2(1) + 8$$

$$y = -2 + 8$$

$$y = 6$$

$$(0, 6)$$

x-int ($y=0$)

$$0 = -2(x-1)^2 + 8$$

$$-8 = -2(x-1)^2$$

$$4 = (x-1)^2$$

$$\pm 2 = x-1$$

$$x-1 = 2$$

$$x = 3$$

$$(3, 0)$$

$$x-1 = -2$$

$$x = -1$$

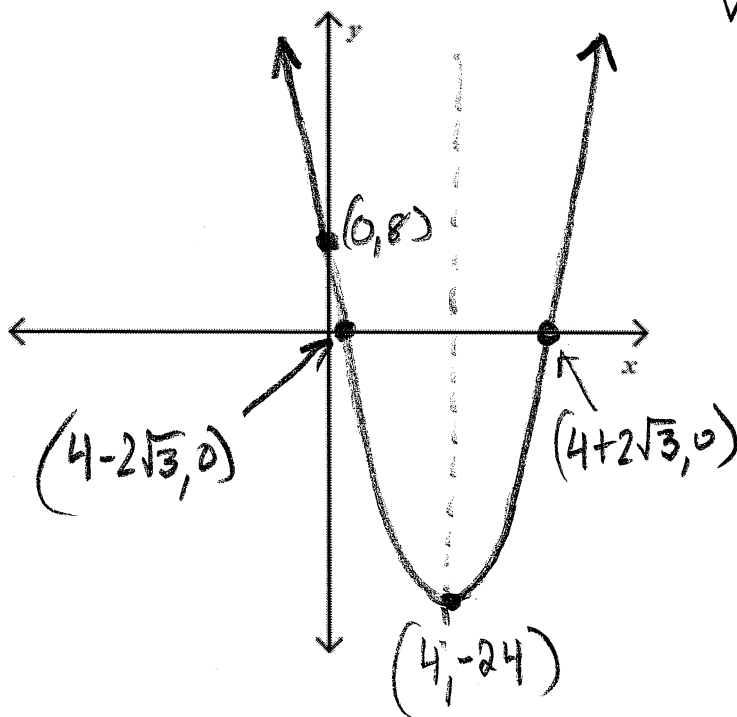
$$(-1, 0)$$

Axis of symmetry

$$x = 1$$

3. Graph: $f(x) = 2(x-4)^2 - 24$

Identify all key points : Intercepts, Vertex, Axis of Symmetry.



Vertex: $(4, -24)$

Concave up

y-intercept ($x=0$)

$$y = 2(x-4)^2 - 24$$

$$y = 2(-4)^2 - 24$$

$$y = 2(16) - 24$$

$$y = 32 - 24$$

$$y = 8$$

$$(0, 8)$$

x-intercepts ($y=0$)

$$0 = 2(x-4)^2 - 24$$

$$24 = 2(x-4)^2$$

$$12 = (x-4)^2$$

$$\pm \sqrt{12} = x-4$$

$$\pm 2\sqrt{3} = x-4$$

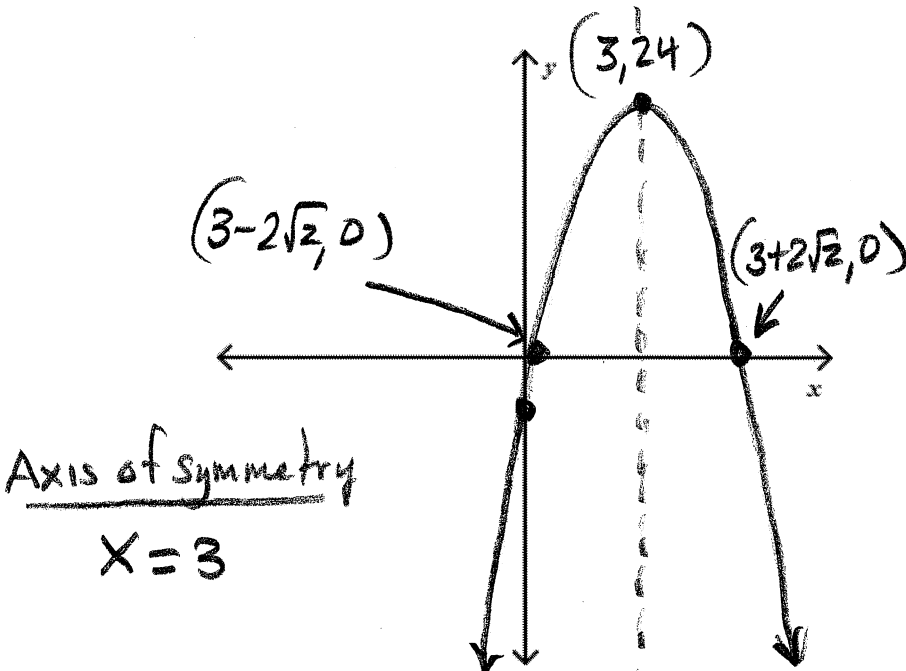
$$x = 4 + 2\sqrt{3}$$

$$x = 4 - 2\sqrt{3}$$

Axis of symmetry:
 $x = 4$

4. Graph: $f(x) = -3(x-3)^2 + 24$

Identify all key points : Intercepts, Vertex, Axis of Symmetry.



Vertex: $(3, 24)$

Concave down

y-int ($x=0$)

$$y = -3(x-3)^2 + 24$$

$$y = -3(-3)^2 + 24$$

$$y = -3(9) + 24$$

$$y = -27 + 24$$

$$y = -3$$

$$(0, -3)$$

X-int ($y=0$)

$$0 = -3(x-3)^2 + 24$$

$$-24 = -3(x-3)^2$$

$$8 = (x-3)^2$$

$$\pm\sqrt{8} = x-3$$

$$\pm 2\sqrt{2} = x-3$$

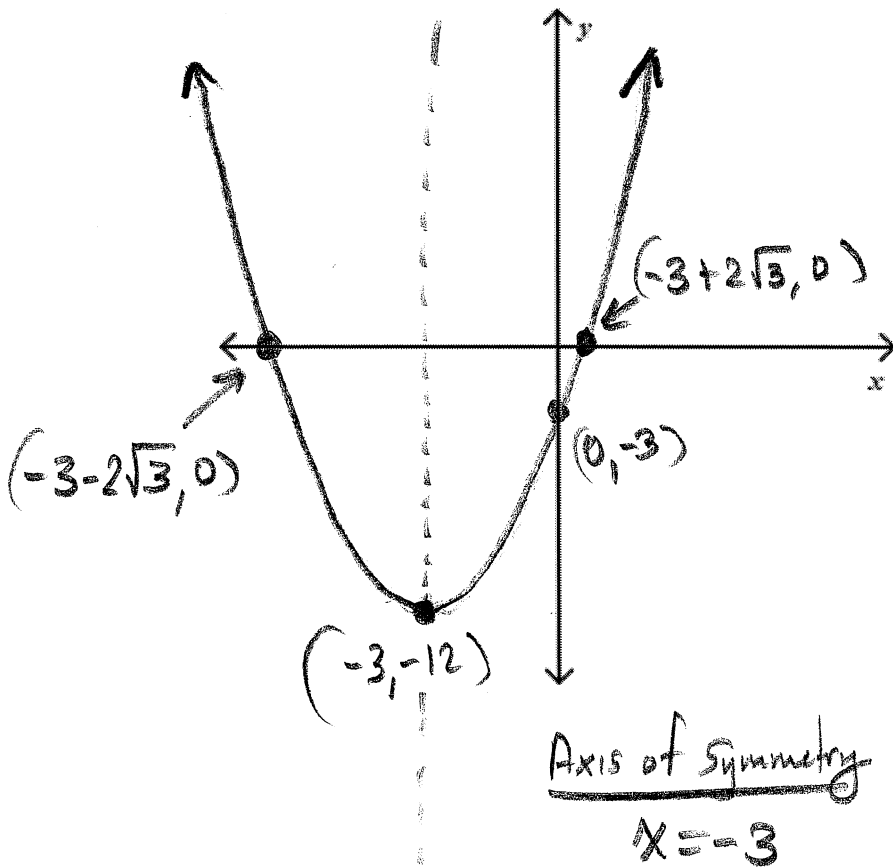
↓

$$x = 3 + 2\sqrt{2}$$

$$x = 3 - 2\sqrt{2}$$

5. Graph: $f(x) = x^2 + 6x - 3$

Identify all key points : Intercepts, Vertex, Axis of Symmetry.



Rewrite

$$x^2 + 6x = 3$$

$$x^2 + 6x + 9 = 3 + 9$$

$$(x+3)^2 = 12$$

$$f(x) = (x+3)^2 - 12$$

Vertex

$$(-3, -12)$$

Concave up

X-int ($y=0$)

y-int

$$(0, -3)$$

$$0 = (x+3)^2 - 12$$

$$12 = (x+3)^2$$

$$\pm\sqrt{12} = x+3$$

$$\pm 2\sqrt{3} = x+3$$

$$x = -3 + 2\sqrt{3}$$

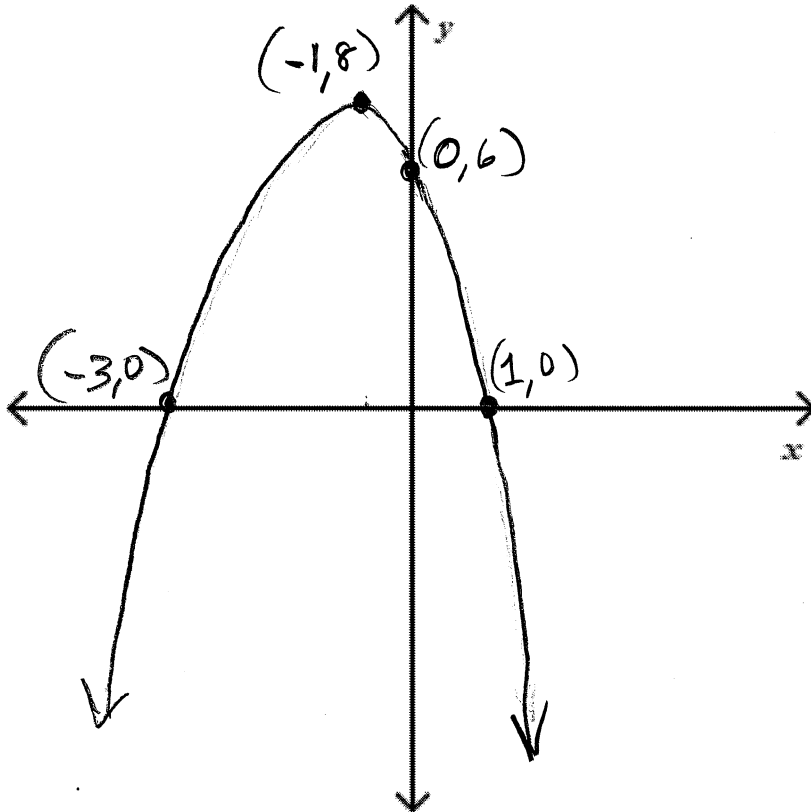
$$x = -3 - 2\sqrt{3}$$

We can approach in two ways:

- ① Rewrite into Vertex form
- ② Use the Standard form and find zeros

6. Graph: $f(x) = -2x^2 - 4x + 6$

Identify all key points: Intercepts, Vertex, Axis of Symmetry.



Concave down
y-intercept (0, 6)

Rewrite into Vertex form

$$\begin{aligned} -2x^2 - 4x &= -6 \\ -2(x^2 + 2x) &= -6 \\ -2(x^2 + 2x + 1) &= -6 - 2 \\ -2(x+1)^2 &= -8 \end{aligned}$$

$$f(x) = -2(x+1)^2 + 8$$

Vertex
(-1, 8)

X-intercepts (y=0)

Method 1 (using Vertex form)

$$-2(x+1)^2 + 8 = 0$$

$$-2(x+1)^2 = -8$$

$$(x+1)^2 = 4$$

$$x+1 = \pm 2$$

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

$$(1, 0)$$

$$\begin{aligned} x &= -1 - 2 \\ x &= -3 \end{aligned}$$

$$(-3, 0)$$

Method 2 (Factoring)

$$-2x^2 - 4x + 6 = 0$$

$$-2(x^2 + 2x - 3) = 0$$

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

$$\downarrow$$

$$x+3=0$$

$$x = -3$$

$$(-3, 0)$$

$$\downarrow$$

$$x-1=0$$

$$x = 1$$

$$(1, 0)$$

method 3

(Quadratic Formula)

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

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(-2)(-3)}}{2(-2)}$$

$$x = \frac{4 \pm \sqrt{16 - (-48)}}{-4}$$

$$x = \frac{4 \pm \sqrt{64}}{-4}$$

$$x = \frac{4 \pm 8}{-4}$$

$$x = -3 \quad x = 1$$

K. Graphing Absolute Value Functions

Objectives: The Student will be able to –

- Graph absolute value functions.
- Identify the intercepts of an absolute value function.
- Identify the vertex of an absolute value function
- Identify the axis of symmetry of an absolute value function
- Determine the concavity of an absolute value function.

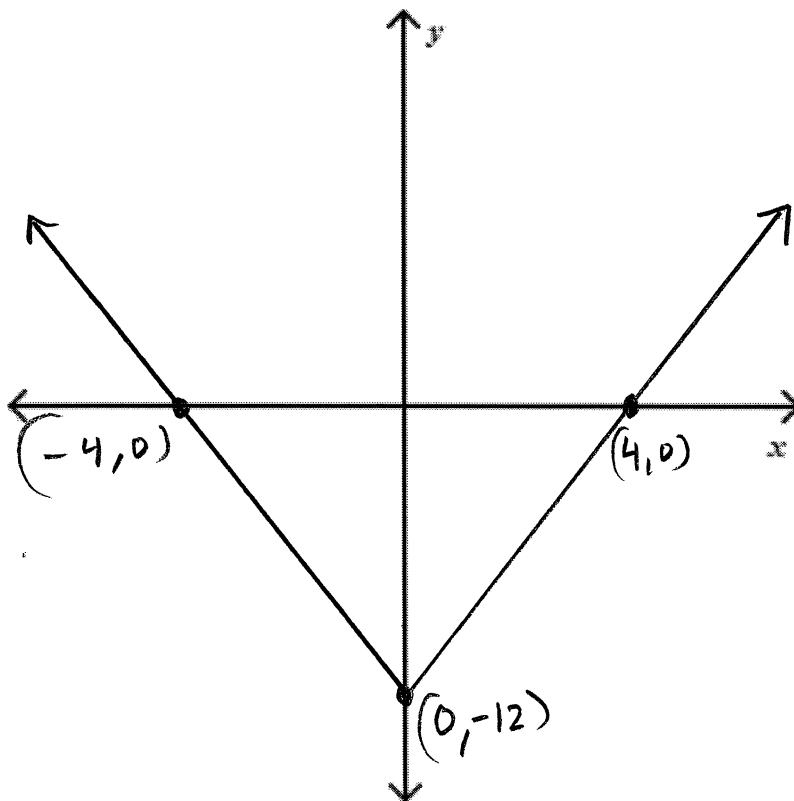
Graphing Absolute Value Functions:

<https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:absolute-value-piecewise-functions/x2f8bb11595b61c86:graphs-of-absolute-value-functions/v/graphing-absolute-value-functions>

<https://www.youtube.com/watch?v=ld4UD98yHio>

1. Graph: $f(x) = 3|x| - 12$

Identify all key points: Intercepts, Vertex, Axis of Symmetry



Vertex (0, -12)

X-intercepts (y=0)

$$3|x| - 12 = 0$$

$$3|x| = 12$$

$$|x| = 4$$

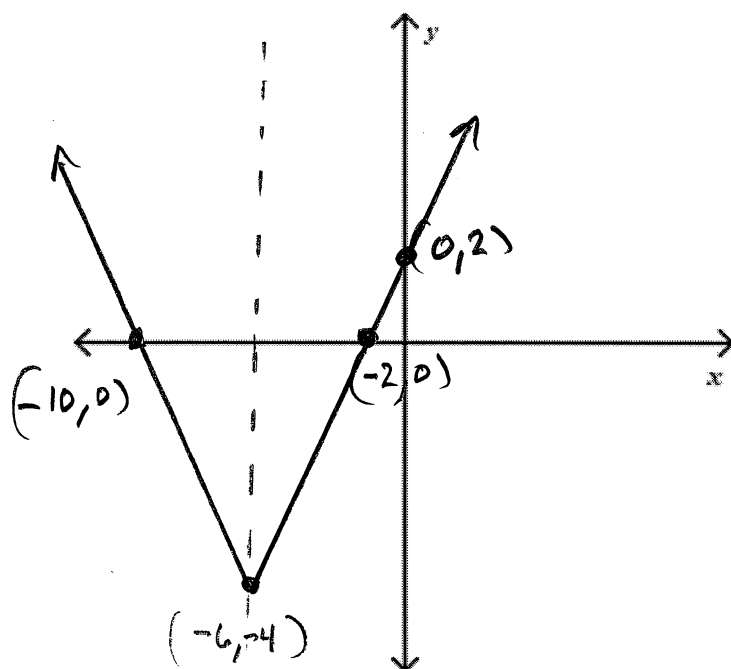
$$x = 4 \quad x = -4$$

Axis of symmetry

$$x = 0$$

2. Graph: $f(x) = |x+6| - 4$

Identify all key points: Intercepts, Vertex, Axis of Symmetry



Vertex: $(-6, -4)$

Concave up

y-int ($x=0$)

$$y = |x+6| - 4$$

$$y = |6| - 4$$

$$y = 6 - 4$$

$$y = 2$$

$$(0, 2)$$

x-int ($y=0$)

$$0 = |x+6| - 4$$

$$4 = |x+6|$$

$$x+6=4$$

$$x=-2$$

$$(-2, 0)$$

$$x+6=-4$$

$$x=-10$$

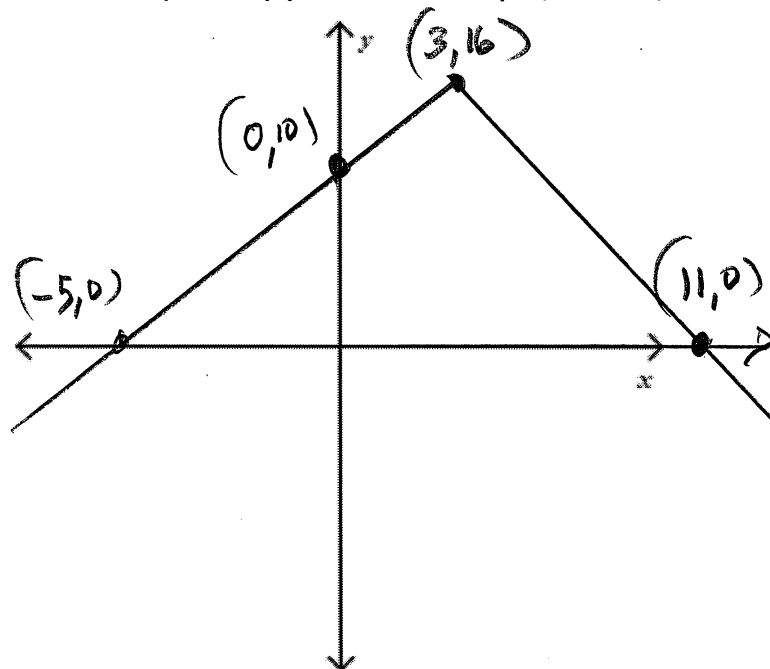
$$(-10, 0)$$

Axis of symmetry

$$x = -6$$

3. Graph: $f(x) = -2|x-3| + 16$

Identify all key points: Intercepts, Vertex, Axis of Symmetry



Vertex: $(3, 16)$

concave down

y-int ($x=0$)

$$y = -2|x-3| + 16$$

$$y = -2|-3| + 16$$

$$y = -2(3) + 16$$

$$y = -6 + 16$$

$$y = 10$$

$$(0, 10)$$

x-int ($y=0$)

$$0 = -2|x-3| + 16$$

$$-16 = -2|x-3|$$

$$8 = |x-3|$$

$$x-3=8$$

$$x=11$$

$$(11, 0)$$

$$x-3=-8$$

$$x=-5$$

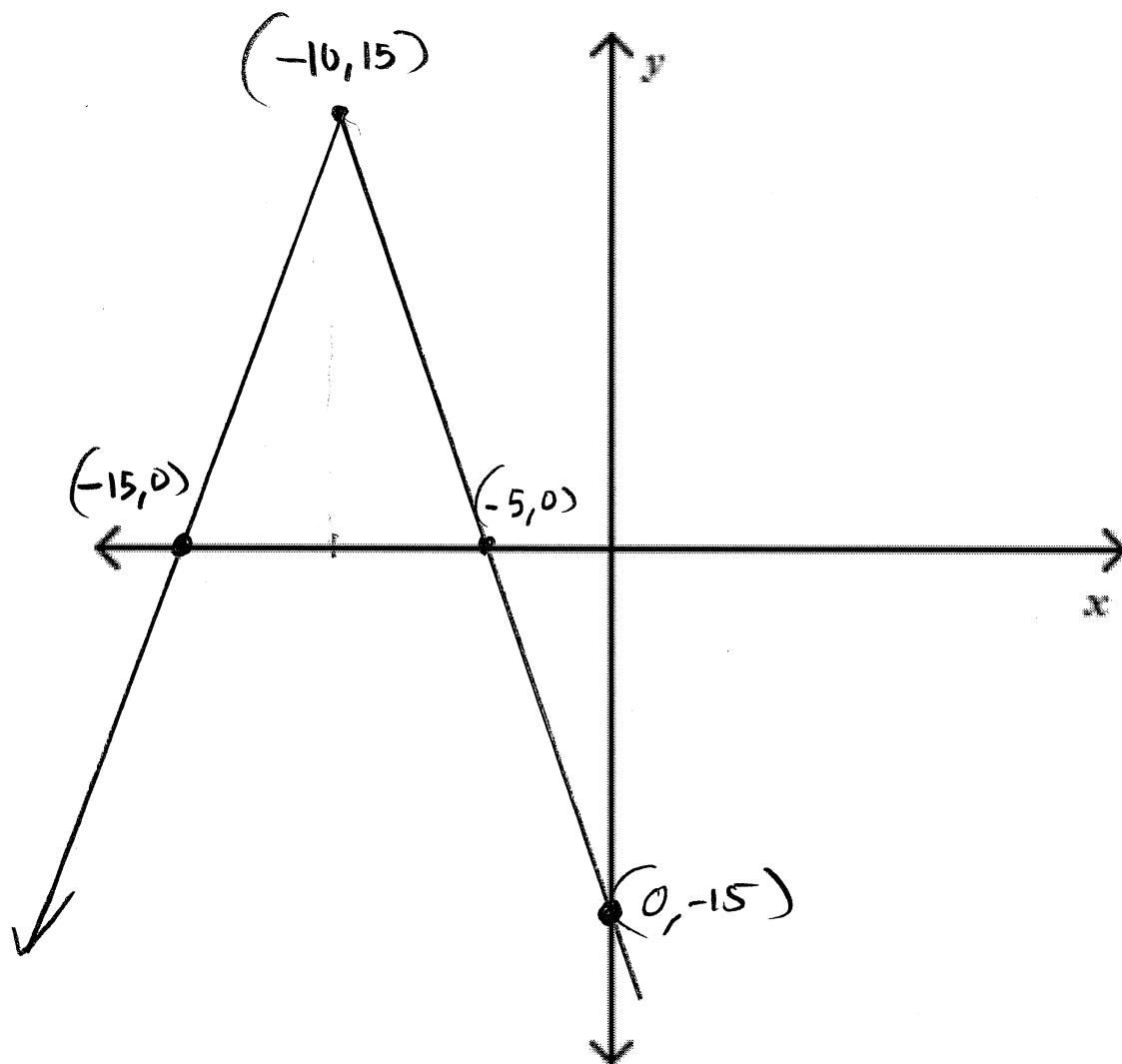
$$(-5, 0)$$

Axis of symmetry

$$x = 3$$

4. Graph: $f(x) = -3|x+10|+15$

Identify all key points: Intercepts, Vertex, Axis of Symmetry



Vertex: $(-10, 15)$

Concave down

y-int ($x=0$)

$$y = -3|x+10|+15$$

$$y = -3|10|+15$$

$$y = -3(10)+15$$

$$y = -30+15$$

$$y = -15 \quad (0, -15)$$

x-int ($y=0$)

$$y = -3|x+10|+15$$

$$0 = -3|x+10|+15$$

$$-15 = -3|x+10|$$

$$5 = |x+10|$$

$$x+10=5$$

$$x=-5$$

$$x+10=-5$$

$$x=-15$$

Axis of symmetry

$$x = -10$$

N. Skill Fluency

Objectives: The Student will be able to –

- Find factors of numbers.
- Find the Greatest Common Factor (GCF) of numbers.
- Add and Subtract Integers.
- Multiply and Divide Integers.
- Simplify Square Roots

Finding Factors and Common Factors:

1. Find all the factors of 48.
2. Find all the factors of 80.
3. Find the greatest common factor (GCF) of 24 and 64.
4. Find the greatest common factor (GCF) of 48 and 160.

Greatest Common Factor:

<https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-expressions-and-variables/cc-6th-gcf/v/greatest-common-divisor>

<https://www.youtube.com/watch?v=uE9O8N5JYB4>

<p>① <u>48</u></p> <table border="0"><tr><td>1</td><td>48</td></tr><tr><td>2</td><td>24</td></tr><tr><td>3</td><td>16</td></tr><tr><td>4</td><td>12</td></tr><tr><td>6</td><td>8</td></tr></table>	1	48	2	24	3	16	4	12	6	8	<p>② <u>80</u></p> <table border="0"><tr><td>1</td><td>80</td></tr><tr><td>2</td><td>40</td></tr><tr><td>4</td><td>20</td></tr><tr><td>5</td><td>16</td></tr><tr><td>8</td><td>10</td></tr></table>	1	80	2	40	4	20	5	16	8	10	<p>③ <u>24</u></p> <table border="0"><tr><td>1</td><td>24</td></tr><tr><td>2</td><td>12</td></tr><tr><td>3</td><td>8</td></tr><tr><td>4</td><td>6</td></tr></table> <p><u>64</u></p> <table border="0"><tr><td>1</td><td>64</td></tr><tr><td>2</td><td>32</td></tr><tr><td>4</td><td>16</td></tr><tr><td>8</td><td>8</td></tr></table> <p>GCF = 8</p>	1	24	2	12	3	8	4	6	1	64	2	32	4	16	8	8
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Performing Operations with Signed Numbers:

1. Add: $2 + (-8) = -6$

2. $(-5) + (-9) = -14$

3. Subtract: $7 - (-9) = 16$

4. Subtract: $-3 - (-12) = 9$

5. Multiply: $4 \cdot (-8) = -32$

6. Multiply: $(-5) \cdot (-9) = 45$

7. Divide: $-20 \div (-4) = 5$

8. Divide: $\frac{24}{-6} = -4$

Operations with Integers:

<https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-negative-numbers-add-and-subtract/cc-7th-sub-neg-intro/v/adding-and-subtracting-negative-number-examples>

<https://www.khanacademy.org/math/arithmetic-home/negative-numbers/mult-divide-negatives/v/multiplying-and-dividing-negative-numbers>

<https://www.youtube.com/watch?v=7mxq8rkMdIM>

Simplify the square Roots:

1. Simplify: $\sqrt{36} = 6$

2. Simplify: $\sqrt{8} = 2\sqrt{2}$

3. Simplify: $\sqrt{20} = 2\sqrt{5}$

4. Simplify: $\sqrt{48} = 4\sqrt{3}$

Simplifying Square Roots

<https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:rational-exponents-radicals/x2f8bb11595b61c86:simplifying-square-roots/v/simplifying-square-roots-1>

https://www.youtube.com/watch?v=8UIXSvqH_Vs