Math 101: College Algebra Equation Sheet
Linear Equations

<u>This expanded Math Equation Sheet is *only* intended for studying purposes.</u>**
<u>NO part of this document is to be used during any proctored exams.</u>**

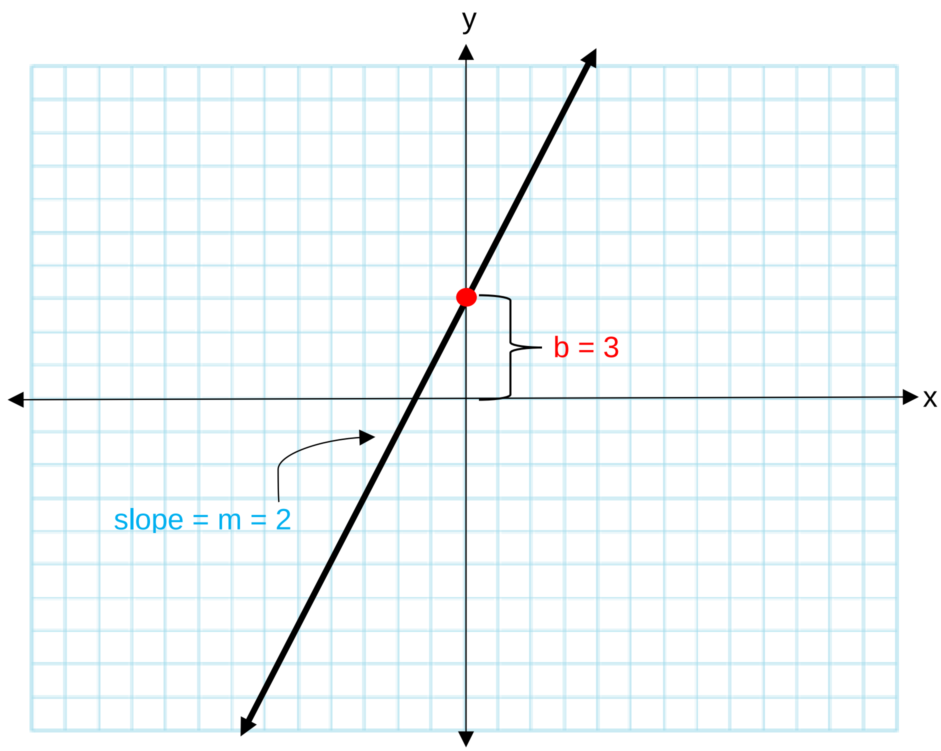
Chapter 1 / Lesson 3: <u>**Slope-Intercept Form**</u>

$$y = \underbrace{m}_{\text{slope}}x + \underbrace{b}_{\text{y- intercept}}$$

$y = 2x + 3$

$y\text{-intecept} = 3$

$slope = 2$



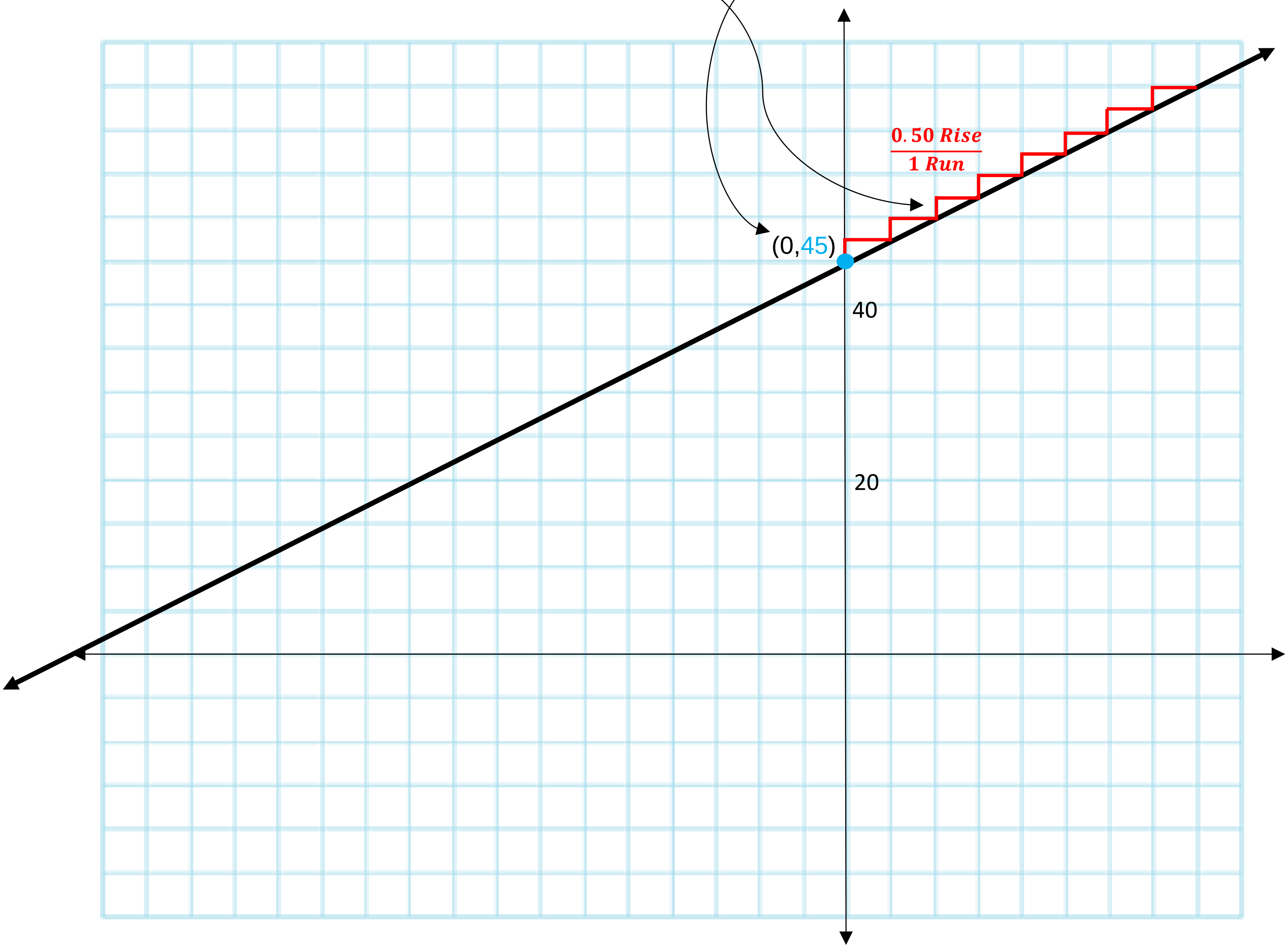
Example:

The TextMore Wireless Co., a telecommunications company, charges the following on a monthly basis: ***$45 flat charge*** *AND* ***$0.50 per outgoing text messages****.*

$45 one-time charge → **y = mx + 45**

$0.50/outgoing text message → **y = 0.50x + b**

y = 0.50x + 45



Other helpful links on Study.com:

- Slope-Intercept Form: Definitions & Examples
- What is Slope Intercept Form? – Definition, Equation & Examples
- Calculating the Slope of a Line: Point-Slope Form, Slope-Intercept Form & More

Chapter 4 / Lesson 2: **Standard Form**

Use for Axis of Symmetry: -b/2a

$$y = ax^2 + bx + c$$

a: concave up (positive number +) or down (negative number -)

c: y-intercept

$y = x^2 + -4x + 5$

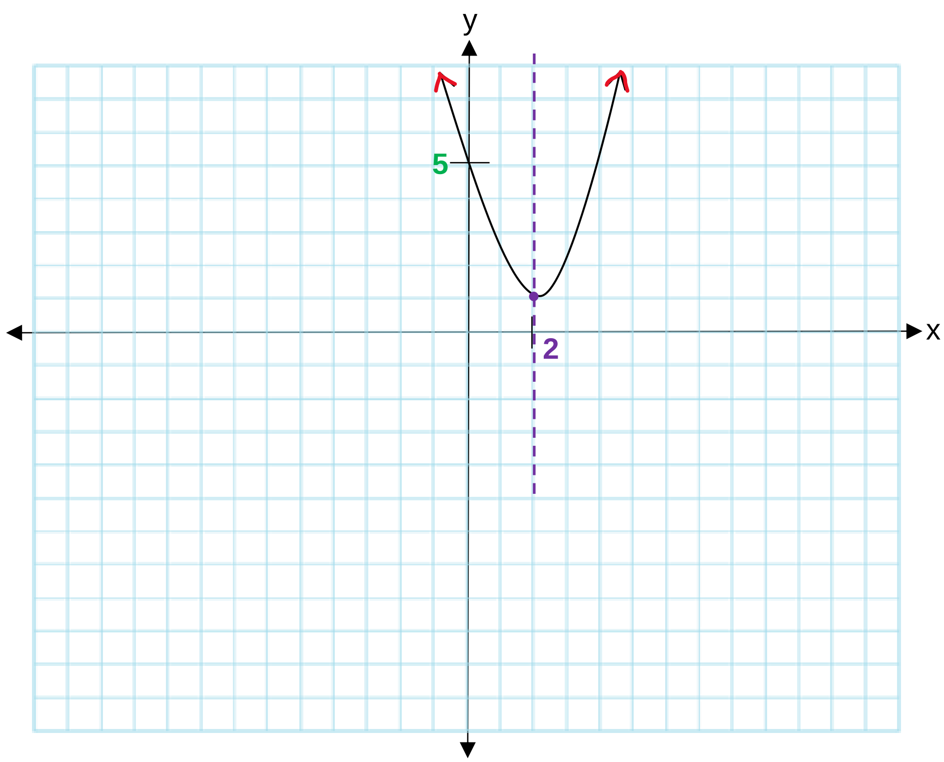
$a = 1$

$b = -4$

y-intercept $= 5$

Axis of Symmetry:

$-(-4)/2(1) = 2$



Other helpful links on Study.com:

- [Writing Standard-Form Equations for Parabolas: Definition & Explanation]
- [How to Write the Equation of a Parabola in Standard Form]
- [The Parabola: Definition & Graphing]

Chapter 4 / Lesson 2: **Intercept Form**

p & q: x-intercepts

$$y = a(x - p)(x - q)$$

a: concave up (positive number +) or down (negative number -)

Use for Axis of Symmetry & x-coor.: $\frac{p+q}{2}$

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

$a = 2$

x-intercepts $= -3$ & 1

y-intercept (Plug in 0 for x and solve for y):

$y = 2(0 + 3)(x - 1) = -6$

Axis of Symmetry: $\frac{-3+1}{2} = -1$

x-coordinate of vertex: ***-1*** *(Same as Axis of Symmetry)*

y-coordinate of vertex: Plug in x-coordinate for x and solve for y:

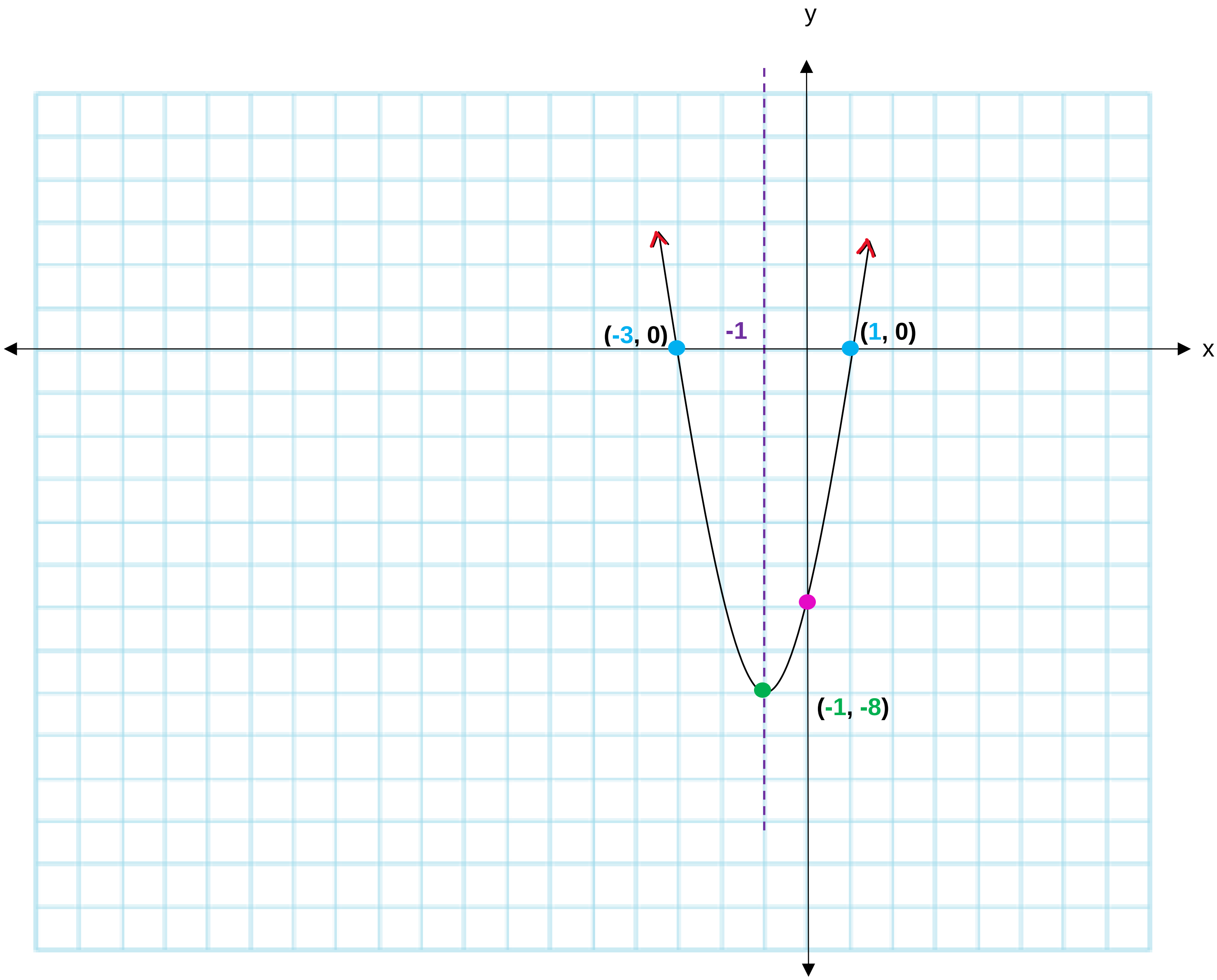
$$y = 2(-1+3)(-1-1)$$

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

$$y = -8$$

NOTE: The x-intercepts are -3 and +1 because the original equation is written as: a(x - p)(x - q). Our given equation is: 2(x + 3)(x - 1) which translates to: 2(x - (-3))(x - (1)).

Graph: y = 2(x + 3)(x – 1)



Other helpful links on Study.com:

- Parabola Intercept Form: Definition & Explanation

Math 101: College Algebra Equation Sheet
Parabolas

Chapter 4 / Lesson 2: **Vertex Form**

k: y-coordinate of vertex

$$y = a(x - h)^2 + k$$

a: concave up (positive number +) or down (negative number -)

h: x-coordinate of vertex

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

$a = 2$

vertex $= (1, -3)$

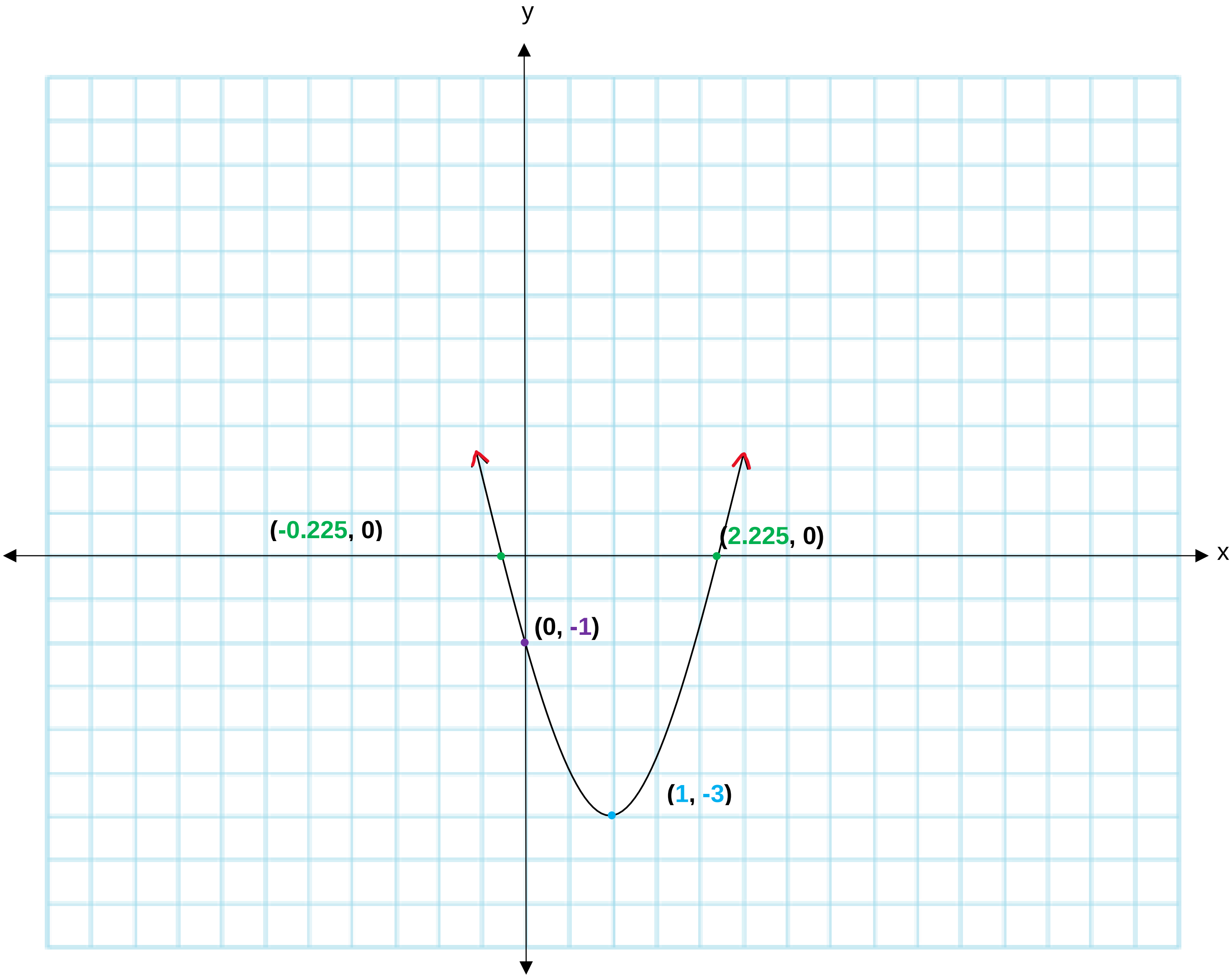
x-intercepts (Set y to 0 and solve for x):

$$0 = 2(x - 1)^2 - 3$$
$$3 = 2(x - 1)^2$$
$$\frac{3}{2} = (x - 1)^2$$
$$\sqrt{\frac{3}{2}} = x - 1$$
$$\sqrt{\frac{3}{2}} + 1$$
$$= 2.225 \; \& \; -0.225$$

y-intercept (Set x to 0 and solve for y):

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

Graph: $y = 2(x - 1)^2 - 3$



Other helpful links on Study.com:

- [How to convert vertex form to standard form]

Chapter 4 / Lesson 10: **Quadratic Formula**

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

Solve for x: $x^2 + 3x - 10 = 0$

a = 1 , b = 3, and c = -10

$$x = \frac{-3 \pm \sqrt{3^2 - 4(1)(-10)}}{2(1)}$$

$$x = \frac{-3 \pm \sqrt{9 + 40}}{2}$$

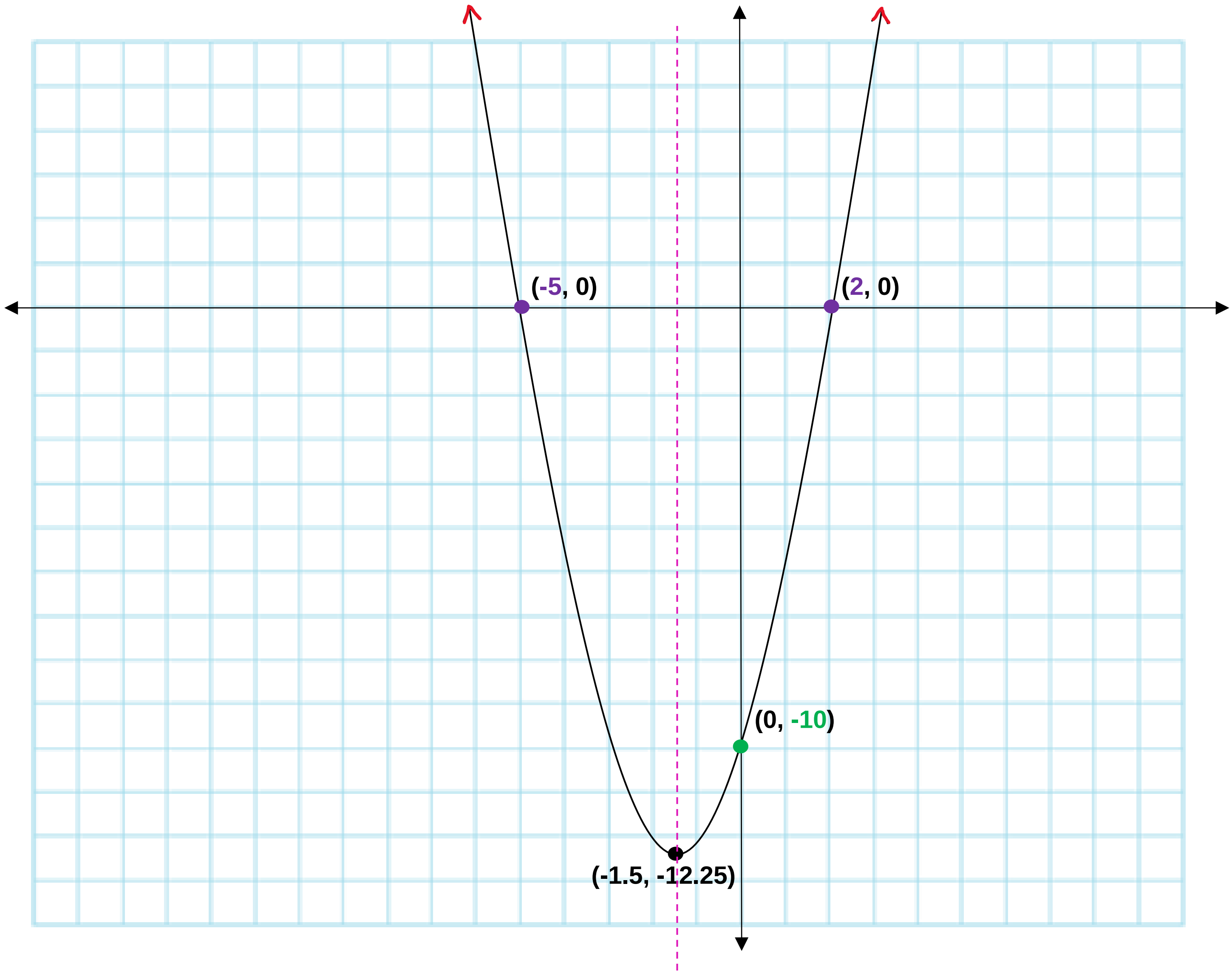
$$x = \frac{-3 \pm \sqrt{49}}{2}$$

$$x = \frac{-3 \pm 7}{2}$$

$$x = \frac{-3+7}{2} = \frac{4}{2} = 2 \qquad \textbf{or} \qquad x = \frac{-3-7}{2} = \frac{-10}{2} = -5$$

These are your x-intercepts

Graph: $y = x^2 + 3x - 10$



x-intercepts: -5 & 2
y-intercept: -10

Axis of Symmetry: -1.5 (See Standard form sheet)

Other helpful links on Study.com:

- Quadratic Functions: Examples & Formula
- The Quadratic Formula: Definition & Example
- How to Use the Quadratic Formula to Find Roots of Equations
- What is a Quadratic Equation? – Definition & Examples
- Quadratics: Equations & Graphs

Math 101: College Algebra Equation Sheet
Properties of Logarithms

Chapter 10 / Lesson 5: **Product Property**

$$\log_b x * y = \log_b x + \log_b y$$

$$\text{EX: } \underbrace{\log_2(\overbrace{3*5}^{15})}_{\sim 3.907} = \underbrace{\log_2 3}_{\sim 1.585} + \underbrace{\log_2 5}_{\sim 2.322} = \sim 3.907$$

Chapter 10 / Lesson 5: **Quotient Property**

$$\log_b\left(\frac{m}{n}\right) = \log_m - \log_n$$

$$\text{EX: } \underbrace{\log_2(\overbrace{32/8}^{4})}_{2} = \underbrace{\log_2 32}_{5} - \underbrace{\log_2 8}_{3} = 2$$

Math 101: College Algebra Equation Sheet
Properties of Exponents

Chapter 6 / Lesson 1: **<u>Power of a Product</u>**

$$(xy)^a = (x^a)(y^a)$$

$$\text{EX: } \underbrace{(\overbrace{2*3}^{6})^2}_{6^2 = 36} = \underbrace{2^2}_{4} * \underbrace{3^2}_{9 = 36}$$

Chapter 6 / Lesson 1: **<u>Power of a Quotient</u>**

$$\left(\frac{x}{y}\right)^a = \left(\frac{x^a}{y^a}\right)$$

$$\text{EX: } \underbrace{\left(\frac{3}{2}\right)^3}_{1.5^3 = 3.375} = \frac{3^3}{2^3} \quad \frac{27}{8} = 3.375$$

Math 101: College Algebra Equation Sheet
Properties of Exponents

Chapter 6 / Lesson 1: <u>**Power to a Power**</u>

$$(x^{a})^{b} = x^{a*b}$$

$$\text{EX: } \underbrace{(3^{2})^{3}}_{9^{3} = 729} = 3^{\overbrace{2*3}^{6}} \; \underbrace{3^{6}}_{729}$$

Chapter 6 / Lesson 1: <u>**Product of Powers**</u>

$$x^{a} * x^{b} = x^{a+b}$$

$$\text{EX: } \underbrace{(3^{2} * 3^{3})}_{9*27 = 243} = 3^{2+3} \; \underbrace{3^{5}}_{243}$$

Math 101: College Algebra Equation Sheet
Properties of Exponents

Chapter 6 / Lesson 1: <u>**Quotient of Powers**</u>

$$\frac{x^{a}}{x^{b}} = x^{(a-b)}$$

$$\textbf{EX: } \underbrace{\frac{2^5}{2^3}}_{\frac{32}{8} = 4} = 2^{\overbrace{(5-3)}^{2}} \quad \underbrace{2^2}_{4}$$