Chapter 1 / Lesson 3: **Slope-Intercept Form**

\[ y = mx + b \]

- **y**-intercept = 3
- **slope** = 2

\[ y = 2x + 3 \]
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 → $45 = mx + 45$

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

$y = 0.50x + 45$

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**

\[ y = ax^2 + bx + c \]

*a*: concave up (positive number +) or down (negative number -)  
*c*: y-intercept  

\[ a = 1 \]  
\[ b = -4 \]  
\[ y \text{-intercept} = 5 \]  

**Axis of Symmetry:**  
\[ \frac{-b}{2a} = \frac{-(-4)}{2(1)} = 2 \]

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**

\[ y = a(x - p)(x - q) \]

- \( p \) & \( q \): \( x \)-intercepts
- \( a \): 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
Chapter 4 / Lesson 2: **Vertex Form**

\[ y = a(x - h)^2 + k \]

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

\( h \): x-coordinate of vertex

\( k \): y-coordinate of vertex

\[ y = 2(x - 1)^2 - 3 \]

\( a = 2 \)

**vertex** = (1, -3)

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

\[
\begin{align*}
0 &= 2(x - 1)^2 - 3 \\
3 &= 2(x - 1)^2 \\
\frac{3}{2} &= (x - 1)^2 \\
\sqrt{\frac{3}{2}} &= x - 1 \\
\sqrt{\frac{3}{2}} + 1 &= 2.225 \& -0.225
\end{align*}
\]

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

\[
\begin{align*}
y &= 2(0 - 1)^2 - 3 \\
y &= 2(-1)^2 - 3 \\
y &= 2(1) - 3 \\
y &= 2 - 3 \\
y &= -1
\end{align*}
\]
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 \( c = -10 \)

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

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

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

\[ x = \frac{-3 \pm 7}{2} \]

\[ x = \frac{-3 + 7}{2} = \frac{4}{2} = 2 \quad \text{or} \quad x = \frac{-3 - 7}{2} = \frac{-10}{2} = -5 \]

These are your \( x \)-intercepts.
Graph: $y = x^2 + 3x - 10$

- **x-intercepts:** -5 & 2
- **y-intercept:** -10
- **Axis of Symmetry:** -1.5

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

\[ \log_b x \times y = \log_b x + \log_b y \]

**EX:** \[\log_2(3 \times 5) = \log_2 3 + \log_2 5\]

\[ \approx 3.907 \quad \approx 1.585 + 2.322 = 3.907 \]

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

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

**EX:** \[\log_2 \left( \frac{32}{8} \right) = \log_2 32 - \log_2 8\]

\[ \approx 4 - 5 - 3 = 2 \]
Chapter 6 / Lesson 1: **Power of a Product**

\[(xy)^a = (x^a)(y^a)\]

**EX:** \[(2\times3)^2 = 2^2 \times 3^2\]

\[6^2 = 36 \quad 4 \times 9 = 36\]

Chapter 6 / Lesson 1: **Power of a Quotient**

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

**EX:** \[\left(\frac{3}{2}\right)^3 = \left(\frac{3^3}{2^3}\right)\]

\[
\begin{array}{c}
1.5^3 = 3.375 \\
27 \div 8 = 3.375
\end{array}
\]
Math 101: College Algebra Equation Sheet

Properties of Exponents

Chapter 6 / Lesson 1: **Power to a Power**

\[(x^a)^b = x^{a \cdot b}\]

**EX:** 
\[(3^2)^3 = 3^{2 \cdot 3} = 3^6 = 729\]

Chapter 6 / Lesson 1: **Product of Powers**

\[x^a \cdot x^b = x^{a + b}\]

**EX:**
\[(3^2 \cdot 3^3) = 3^{2+3} = 3^5 = 243\]
Chapter 6 / Lesson 1: **Quotient of Powers**

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

**Ex:** \[
\frac{2^5}{2^3} = 2^{(5-3)} = 2^2 = 4
\]

\[
\frac{32}{8} = 4
\]