PART I: Vocabulary
Use the word bank to fill in the blanks in the sentences below. YOU MAY USE A WORD MORE THAN ONCE, but please don't use any words not at all!

<table>
<thead>
<tr>
<th>Word Bank</th>
<th>Vertex Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>( Y = ax^2 + bx + c )</td>
<td>Y-intercept</td>
</tr>
<tr>
<td>( Y = a(x - h)^2 + k )</td>
<td>Vertically</td>
</tr>
<tr>
<td>(h, k)</td>
<td>X-intercept</td>
</tr>
<tr>
<td>Axis of symmetry</td>
<td>Horizontal</td>
</tr>
</tbody>
</table>

1.) A **parabola** is the graph of a quadratic function.
2.) The **x-intercept** \( y = a(x - h) \) is also the x-value...
3.) The vertex form of a quadratic function is the equation \( y = a(x - h)^2 + k \).
4.) The point \((h, k)\) is the **vertex** of the parabola.
5.) The standard form of a quadratic function is the equation \( y = ax^2 + bx + c \).
6.) The \( c \) value in the standard form equation is the **vertex y-value**.
7.) The formula \( x = -b/2a \) gives you the **axis of symmetry** of the parabola.
8.) When \( a \) is **positive**, the vertex is the maximum value of the parabola.
9.) When \( a \) is **negative**, the vertex is the minimum value of the parabola.
10.) Changing the value of \( h \) in the vertex form equation shifts the graph **horizontally**.
11.) Changing the value of \( k \) in the vertex form equation shifts the graph **vertically**.
12.) Label the **axis of symmetry**, **vertex**, and **y-intercept** on the graph below:
1. \( f(x) = (x + 3)^2 - 4 \)
   - Vertex: \(-2, -4\)
   - Axis of Symmetry: \(-2\)
   - Domain: \(\mathbb{R}\)
   - Range: \((-4, \infty)\)
   - Increasing Interval: \(-2\)
   - Decreasing Interval: \(-\infty, -2\)
   - Maximum or Minimum? at \(-2\)

2. \( y = 2(x - 2)^2 + 5 \)
   - Vertex: \(-2, 2\)
   - Axis of Symmetry: \(-2\)
   - Domain: \(\mathbb{R}\)
   - Range: \((-5, \infty)\)
   - Increasing Interval: \(-5\)
   - Decreasing Interval: \(-10, \infty\)
   - Maximum or Minimum? at \(-5\)
### Vertex Form Worksheet

#### Part 1: Standard Form vs. Vertex Form

<table>
<thead>
<tr>
<th>Equation 1</th>
<th>Equation 2</th>
<th>Equation 3</th>
<th>Equation 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = x^2 - 2x - 35$</td>
<td>$y = 3(x-1)^2 + 3$</td>
<td>$y = -\frac{2}{3}(x-4)^2 + 7$</td>
<td>$y = -2x^2 + 16x - 24$</td>
</tr>
<tr>
<td>Standard</td>
<td>vertex</td>
<td>vertex</td>
<td>Standard</td>
</tr>
</tbody>
</table>

#### Part 2: Vertex of Quadratic Functions

<table>
<thead>
<tr>
<th>Equation 5</th>
<th>Equation 6</th>
<th>Equation 7</th>
<th>Equation 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = 3(x-7)^2 - 1$</td>
<td>$y = 3(x+2)^2 - 5$</td>
<td>$y = (x-3)^2$</td>
<td>$y = -4(x-2)^2 + 4$</td>
</tr>
<tr>
<td>vertex</td>
<td>vertex</td>
<td>vertex</td>
<td>vertex = 2, 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equation 9</th>
<th>Equation 10</th>
<th>Equation 11</th>
<th>Equation 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = 2(x+1)^2 - 3$</td>
<td>$y = (x+4)^2$</td>
<td>$y = \frac{1}{2}(x-5)^2 + 1$</td>
<td>$y = -(x+6)^2 + 10$</td>
</tr>
<tr>
<td>-1, 2</td>
<td>-4 and 0</td>
<td>5 and 1</td>
<td>-6, 13</td>
</tr>
</tbody>
</table>

#### Part 3: Standard Form

<table>
<thead>
<tr>
<th>Equation 13</th>
<th>Equation 14</th>
<th>Equation 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = 2x^2 - 16x + 31$</td>
<td>$y = -x^2 - 4x + 1$</td>
<td>$y = 3x^2 - 6x + 4$</td>
</tr>
<tr>
<td>$x = \frac{-b}{2a}$</td>
<td>$x = \frac{-b}{2a}$</td>
<td>$x = \frac{-b}{2a}$</td>
</tr>
<tr>
<td>$= \frac{8}{2 \cdot 2} = 8$</td>
<td>$= \frac{-4}{2 \cdot -1} = 2$</td>
<td>$= \frac{-4}{2 \cdot 3} = -\frac{4}{6}$</td>
</tr>
<tr>
<td>$2(8)^2 - 16(0) + 21$</td>
<td>$2(2)^2 - 16(0) + 2$</td>
<td>$12(2) - (-12)(0)$</td>
</tr>
<tr>
<td>$= 128 - (-128)$</td>
<td>$= 21$</td>
<td>$= 256$</td>
</tr>
</tbody>
</table>

#### Part 4: Graphing Quadratic Equations

**Given a quadratic equation in vertex form, find the vertex, axis of symmetry, whether the graph opens up or down, the maximum or minimum, and the y-intercept. Graph it!**

16. $y = -2(x + 2)^2 + 4$  *Take from vertex, make it Standard*

- **Vertex:** $-2, 4$
- **Axis of symmetry:** $-2$
- **Opens:** up  
- **Maximum**  
- **Minimum**  
- **Max/Min Value:** ________  
- **y-intercept:** ________
For problems 1 to 8, match each graph with its equation.

1. \[ a(x) = (x + 1)^2 - 1 \]
2. \[ b(x) = -x^2 - 1 \]
3. \[ c(x) = (x - 1)^2 + 1 \]
4. \[ d(x) = x^2 - 2x + 1 \]
5. \[ e(x) = x^2 + 2x + 1 \]
6. \[ f(x) = (x + 1)^2 + 1 \]
7. \[ g(x) = (x - 1)^2 - 1 \]
8. \[ h(x) = x^2 - 1 \]
Study guide (scrap paper)

1. Determine whether it is a solution

\[ -35 = 8(0) + 5 \]
\[ -24 + 5 \text{ (collected)} \]
\[ -35 = -19 \]

if it doesn't equal \(-35\) it is not a solution

\[ -35 = 8(1) + 5 \]
\[ 8 + 5 \]
\[ -35 = -13 \]

\[ -35 = 8(-15) + 5 \]
\[ -40 + 5 \]
\[ -35 = -25 \]

2. Find the slope of the line passing through the points \((-9, -5)\) and \((4, 2)\)

\[ \text{slope} = \frac{y_2 - y_1}{x_2 - x_1} \]

\[ \frac{5 - (-5)}{4 - (-9)} = \frac{10}{13} \]
Bellringer

Find the x intercepts, axis of symmetry, and vertex of the following quadratic equation

\[ f(x) = x^2 + 8x + 12 \]

**AOS**

\[ x = \frac{-8}{2(1)} = -4 \]

**Vertex**

\[ f(x) = -(4^2 + 8(-4) + 12) \]
\[ 16 - 32 + 12 \]
\[ y = -4 \]
\[ \text{vertex} = (-4, -4) \]

**x-intercept**

\[ 0 = x^2 + 8x + 12 \]
\[ 0 = (x + 6)(x + 2) \]
\[ x + 6 = 0 \quad x + 2 = 0 \]
\[ -6 -6 \quad -2 -2 \]
\[ x = -6 \quad x = -2 \]
Unit 3 Review – Systems of Equations

Reviews do NOT cover all material from the lessons but will hopefully remind you of key points. To be prepared, you must study all packets from Unit 3.

3.1 Standard Form Equations of Lines

A solution of a two-variable equation is a coordinate pair \((x, y)\). If this solution is substituted into an equation, then the equation is true. When ALL of these solutions are plotted on a coordinate grid, it creates the graph of a line.

1. Circle all the ordered pairs \((x, y)\) that are solutions to \(5x + 2y = -1\).

\((-5, 10)\) \((-3, 7)\) \((-1, 2)\) \((3, -8)\) \((4, -10)\)

2. \(x - 3y = 9\)

Know how to graph by solving for \(y\) or finding intercepts.

3.2 Systems of Inequalities

A solution set of an inequality are all the points on ONE SIDE of the line. The line is also included if it is an “or equal to” inequality represented by \(\leq\) or \(\geq\). To discover which side of the line is shaded, you can either use a test point like \((0, 0)\), or solve for \(y\) and shade above or below the line depending on if it is the greater than or less than symbol (respectively).

3. Graph the inequality \(3x - y \leq 3\)

4. Graph the system of inequalities:
   \[
   \begin{align*}
   x + y & \geq 2 \\
   x - 3y & < 6
   \end{align*}
   \]

3.3 Graph Systems of Equations

A system of equations will have one of three types of solutions.

5. \[
\begin{align*}
x &= -3 \\
y &= -\frac{5}{3}x - 3
\end{align*}
\]

Answer: 

6. \[
\begin{align*}
3x - y &= -2 \\
6x - 2y &= 2
\end{align*}
\]

Answer: 

7. \[
\begin{align*}
x + y &= -4 \\
3y &= -3x - 12
\end{align*}
\]

Answer: 

Assignment #8

Inequalities

- $x$ is always on the left side.

1. \[
\frac{8x}{2} < 15 \Rightarrow 4x < 30 \Rightarrow \frac{4x}{4} < \frac{30}{4} \Rightarrow x < 7.5
\]

2. \[
-36 + x < 8
\]

3. \[
\frac{15 - 5x}{-5} \Rightarrow \frac{15}{-5} - \frac{5x}{-5} \Rightarrow 3 - x
\]

4. \[
\frac{x - 4}{y} < 1
\]

5. \[
x - 6 \leq 3
\]
10. \[ -\frac{3x + 8}{-8} = \frac{12}{12} \]
   \[ -3x + 8 = 12 \]
   \[ -3x = 4 \]
   \[ x = \frac{-4}{3} \]
   \[ \text{answer: } x = -\frac{4}{3} \]

11. \[ 16x - 7 = -61 \]
   \[ 16x = -54 \]
   \[ x = -\frac{54}{16} \]
   \[ x = -\frac{27}{8} \]
   \[ \text{answer: } x = -\frac{27}{8} \]

12. \[ 10c + \frac{5}{2} = 42 \]
   \[ 10c = 40 \]
   \[ c = 4 \]
   \[ \text{answer: } c = 4 \]

13. \[ -1y - 2d = 1 \]
   \[ +11 \]
   \[ 2d = 12 \]
   \[ d = 6 \]
   \[ \text{answer: } d = 6 \]
5. \( y = -2x - 5 \)  
\( \Delta y = -2(1) - 2 \)  
\(-2 - 5 = -7\)  
\( \Delta y - 2(2) - 5 \)  
\( y = -5 \)  
neither

6. \( x, y \)  
\( \frac{x}{10} \)  
\( \frac{8}{2} = 4 \)  
\( \frac{5}{2} \)  
\( \frac{3}{y} \)

7. \( y = -2x - y \)  
\( y = -2(-3) \)  
\( y = -6 \)  
\( 6 - y \)  
\( 6 - 6 = 2 \)  
\( \frac{x}{2} \)  
\( \frac{1}{2} \)

8. \( 2x + 3y = 10 \)  
\( 2(1) + 3(2) = 10 \)  
\( 2 + 6 \)  
\( \frac{x}{y} \)  
\( 1, 1 \)  
\( -1, -5 \)  
\( x, y \)  
\( (5, 2), (4, 1) \)

9. \( y = 8x + 2 \)  
\( y = 8x + 2 \)  
\( y = 8(2) + 2 \)  
\( y = 20 + 2 \)  
\( y = 22 \)  
\( -1 = y_{2} \)

10. \( 5(5) - 2(3) = 18 \)  
\( 25 - 6 = 18 \)  
\( 19 = 18 \)  
\( 5(y) - 2(1) = 18 \)  
\( 20 - 2 = 18 \)