Graphs of Quadratic Equations Handout/Worksheet

1. **Graphs of** $f(x) = x^2 + k$

   (a) If $k > 0$, then the graph of $f(x) = x^2 + k$ is the same as the graph of $y = x^2$ shifted *up* k units.

   (b) If $k < 0$, then the graph of $f(x) = x^2 + k$ is the same as the graph of $y = x^2$ shifted *down* $|k|$ units.

2. **Graphs of** $f(x) = (x - h)^2$

   (a) If $h > 0$, then the graph of $f(x) = (x - h)^2$ is the same as the graph of $y = x^2$ shifted *right* h units.

   (b) If $h < 0$, then the graph of $f(x) = (x - h)^2$ is the same as the graph of $y = x^2$ shifted *left* $|h|$ units.

3. **Graphs of** $f(x) = ax^2$

   (a) If $a > 0$, the parabola opens upward. Furthermore,

   - If $0 < a < 1$, then the graph of $f(x) = ax^2$ is the same as the graph of $y = x^2$ with a *vertical shrink* by a factor of a.
   - If $a > 1$, then the graph of $f(x) = ax^2$ is the same as the graph of $y = x^2$ with a *vertical stretch* by a factor of a.

   (b) If $a < 0$, the parabola opens downward. Furthermore,

   - If $0 < |a| < 1$, then the graph of $f(x) = ax^2$ is the same as the graph of $y = -x^2$ with a *vertical shrink* by a factor of $|a|$.
   - If $|a| > 1$, then the graph of $f(x) = ax^2$ is the same as the graph of $y = -x^2$ with a *vertical stretch* by a factor of $|a|$.

4. The graphs of $f(x) = a(x - h)^2 + k$

   (a) The vertex is located at (h, k).

   (b) The axis of symmetry is the line $x = h$.

   (c) If $a > 0$, the parabola opens upward and k is the **minimum value** of the function.

   (d) If $a < 0$, the parabola opens downward, and k is the **maximum value** of the function.

5. Given the function defined by $h(x) = -\frac{1}{2}(x - 4)^2 + 2$

   - Identify the vertex.
   - Sketch the graph.
   - Identify the axis of symmetry.

- Identify the maximum and minimum value of the function.

6. Given $f(x) = x^2 + 8x - 1$
   - Write the equation in the form $f(x) = a(x - h)^2 + k$.
   - Identify the vertex, axis of symmetry and minimum value of the function.

7. Given $h(x) = x^2 - 2x + 5$
   - Use the vertex formula to find the vertex.
   - Find the x- and y-intercepts.
   - Sketch the function.