3.1 Investigating Quadratic Functions in Vertex Form

Definitions:

Quadratic function:

-a polynomial function with degree of 2

-in the form: $f(x) = ax^2 + bx + c$

Vertex:

-the lowest or highest point of the graph

-the y-value of the vertex is the minimum or maximum

Axis of Symmetry

-the vertical line that passes through the vertex

-the x-value of the vertex is the axis of symmetry

Vertex Form:

All parabolas can be written in the form:

$$y = a(x - p)^2 + q$$

Try:

Effect of a in $f(x) = ax^2$ on the graph $f(x) = x^2$

1. Using a table of values, sketch the following functions on the same graph:

$$f(x) = x^2$$
$$f(x) = 2x^2$$
$$f(x) = \frac{1}{2}x^2$$
$$f(x) = -x^2$$
$$f(x) = -2x^2$$
$$f(x) = -\frac{1}{2}x^2$$

Effect of p in $f(x) = (x - p)^2$ on the graph $f(x) = x^2$

2. Using a table of values, sketch the following functions on the same graph:

$$f(x) = x^2$$

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

Effect of q in $f(x) = x^2 + q$ on the graph $f(x) = x^2$

3. Using a table of values, sketch the following functions on the same graph:

$$f(x) = x^2$$
$$f(x) = x^2 + 4$$
$$f(x) = x^2 - 3$$

Example 1:

Sketch the graphs of Quadratic Functions in Vertex form

Determine the following:

-vertex

-domain and range

-direction of opening

-equation of axis of symmetry

a.) $y = \frac{1}{2}(x - 2)^2 - 4$

b.) $y = -3(x + 1)^2 + 3$