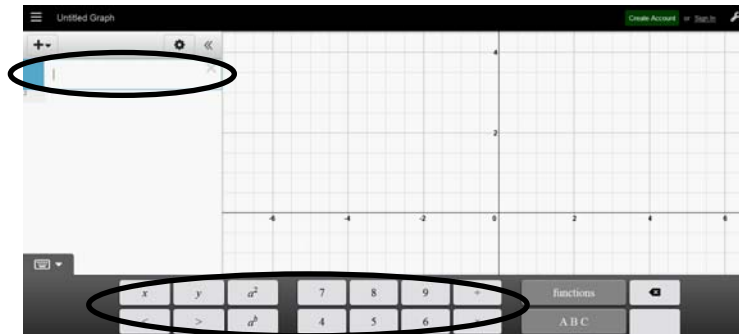


Worksheet 4-4: Quadratic Relations $y = x^2 + k$

Go to <https://www.desmos.com/calculator> (or click link [HERE](#))

Enter the equation of the quadratic function in the box on the top left corner using the bottom keys.



Investigation 1: $y = x^2 + k$, when k is positive

(a) Graph $y = x^2$ and $y = x^2 + 1$ on the same axes.

Compare the two parabolas,

(i) how are they similar?

(ii) how are they different?

(b) Graph $y = x^2$ and $y = x^2 + 3$ on the same axes.

Compare the two parabolas,

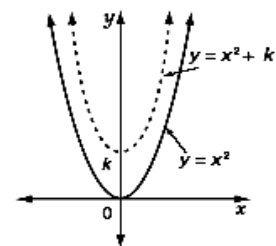
(i) how are they similar?

(ii) how are they different?

When k is positive, the graph of the quadratic relation $y = x^2 + k$ can be obtained from the graph of $y = x^2$ by a vertical translation of k units upward, above the x -axis.

(i.e. when $k > 0$, the graph of $y = x^2$ is shifted upward by k units, above the x -axis.) $y = x^2 + k$

The vertex of $y = x^2 + k$ is at $(0, k)$ and its y -intercept is k .



(a) Graph $y = x^2$ and $y = x^2 - 2$ on the same axes.

Compare the two parabolas,

(i) how are they similar?

(ii) how are they different?

(b) Graph $y = x^2$ and $y = x^2 - 5$ on the same axes.

Compare the two parabolas,

(i) how are they similar?

(ii) how are they different?

When k is negative, the graph of the quadratic relation $y = x^2 + k$ can be obtained from the graph of $y = x^2$ by a vertical translation of k units downward, below the x -axis.

(i.e. when $k < 0$, the graph of $y = x^2$ is shifted downward by k units, below the x -axis.)

The vertex of $y = x^2 + k$ is at $(0, k)$ and its y -intercept is k .

1. For each of the following parabolas, state the vertex, y -intercept, axis of symmetry and equation for the quadratic relation.

