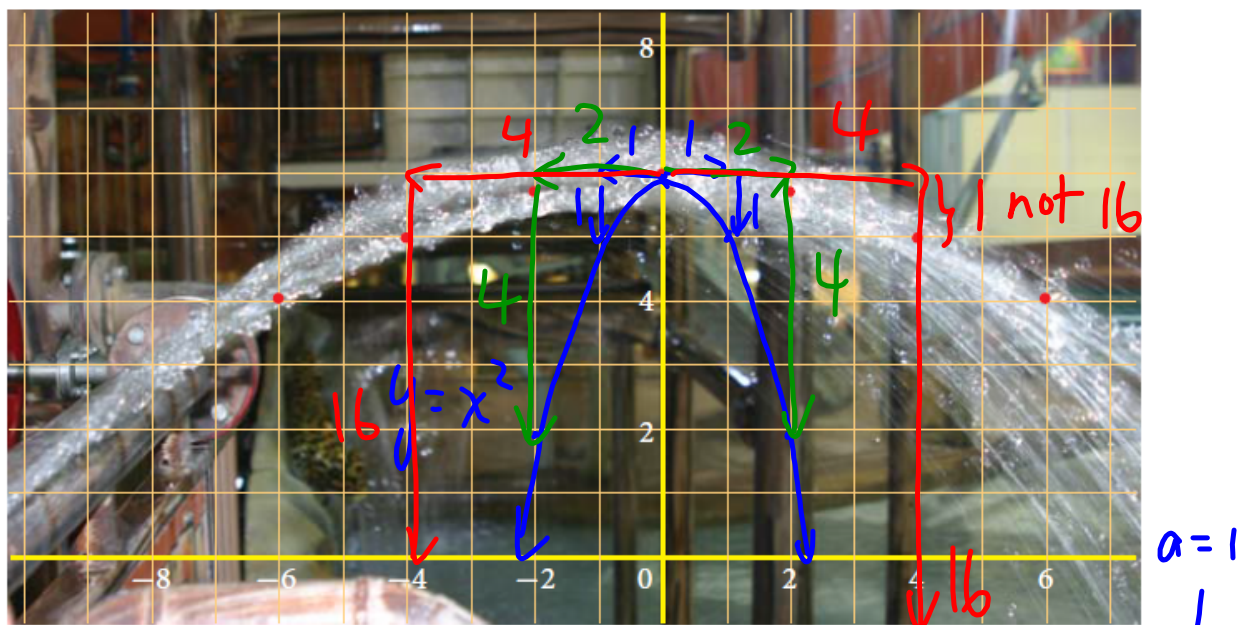


p. 193 Section 4.2

10. The path of water from this fountain can be modelled by a relation of the form $y = ax^2 + k$.



- a) What are the coordinates of the vertex of this parabola?
- b) Determine the approximate value of a .
- c) Write an equation to model the parabola.

$$y = ax^2 + k$$

$$a = -\frac{1}{16} \text{ or } -0.0625$$

$$k = 6$$

$$y = -\frac{1}{16}x^2 + 6$$

x	x^2
0	0
1	1
2	4
3	9
4	16

$a = 1$

Mini-Test 4-1

WS 4-1

WS 4-2

WS 4-3

WS 4-4



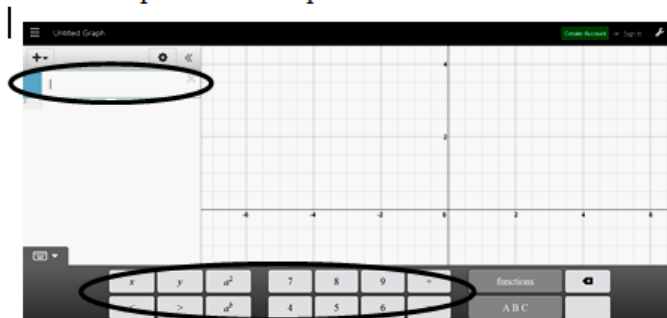
Plus textbook work!

Horizontal Shift

Worksheet 4-5: Quadratic Relations $y = (x-h)^2$

$h = +ve$
 $h = -ve$
 $x - -5 \rightarrow x + 5$

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: $y = (x-h)^2$ \swarrow to the right

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

Compare the two parabolas,

(i) how are they similar?

(ii) how are they different?

- Same shape
- Same opening direction
- Same minimum value of 0
- different vertex
- different axis of symmetry

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

Compare the two parabolas,

(i) how are they similar?

(ii) how are they different?

- Same shape
- Same opening direction
- Same minimum value of 0
- different vertex
- different axis of symmetry

Investigation 2: $y = (x + h)^2$ *to the left*

(a) Graph $y = x^2$ and $y = (x + 6)^2$ on the same axes.

Compare the two parabolas,

(i) how are they similar?

(ii) how are they different?

- | | |
|---|--|
| <ul style="list-style-type: none"> - Same shape - Same opening direction - Same minimum value of 0 | <ul style="list-style-type: none"> - different vertex - different axis of symmetry |
|---|--|

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

Compare the two parabolas,

(i) how are they similar?

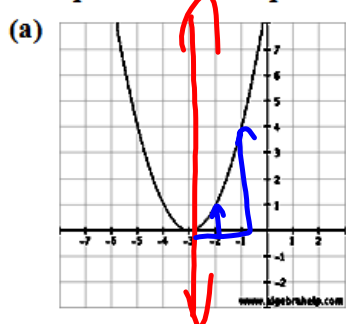
(ii) how are they different?

- | | |
|---|--|
| <ul style="list-style-type: none"> - Same shape - Same opening direction - Same minimum value of 0 | <ul style="list-style-type: none"> - different vertex - different axis of symmetry |
|---|--|

The graph of the quadratic relation $y = (x+h)^2$ can be obtained from the graph of $y = x^2$ by a horizontal translation of h units to the left.

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

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



$$\text{Vertex} = (-3, 0)$$

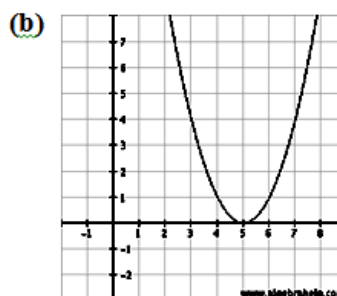
$$x\text{-intercept} = -3$$

axis of symmetry:

$$x = -3$$

$$y = (x+3)^2$$

$$\begin{array}{l} 1 \\ 2 \\ 4 \end{array}$$



$$\text{Vertex} = (5, 0)$$

$$x\text{-intercept} = 5$$

axis of symmetry:

$$x = 5$$

$$y = (x-5)^2$$