Sec 5-1: Quadratic Function

A function is a quadratic if the largest exponent is 2.

Standard Form of a Quadratic Function

$$y = ax^2 + bx + c$$

Quadratic Term

Linear Term
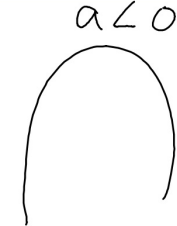
Constant

$$y = ax^2 + bx + c$$

The graph of a quadratic function is a PARABOLA

Parabolas either open up or open down.

Parabola that opens up:
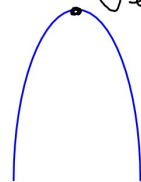
$a > 0$

Parabola that opens down:

$a < 0$

The VERTEX of a parabola is

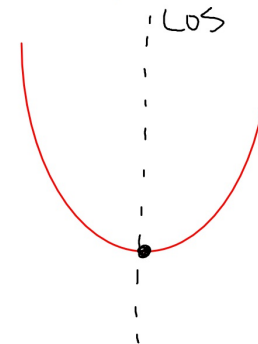The lowest point if the parabola opens up.
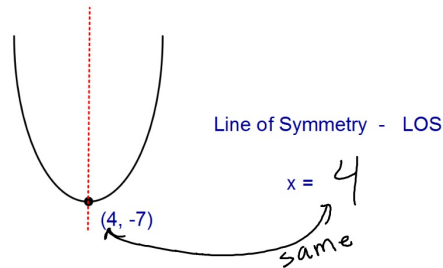
or

The hightest point if the parabola opens down.

vertex

vertex

Every parabola has a Line of Symmetry (LOS).

The LOS is a vertical line that passes through the vertex.

LOS

Panel 1 (top-left)

If the the vertex of a parabola is (4, -7) what is the equation of the Line of Symmetry?

Line of Symmetry - LOS

x = 4

(4, -7)

same

Panel 2 (top-right)

Use this equation of a quadratic.

$$y = x^2 - 4x + 7$$

The Line of Symmetry is x = 2

What are the coordinates of the vertex?

$(2)^2 - 4(2) + 7$
$4 - 8 + 7$
$-4 + 7$

(2 , 3)

To find the y-coordinate just replace x in the equation with 2 and find the value of y.

Panel 3 (bottom-left)

The vertex of a parabola represents either the maximum value or the minimum value of the quadratic function.

The vertex of a parabola is a maximum if.....
the parabola opens down

$a < 0$

The vertex of a parabola is a minimum if.....
the parabola opens up

$a > 0$

Panel 4 (bottom-right)
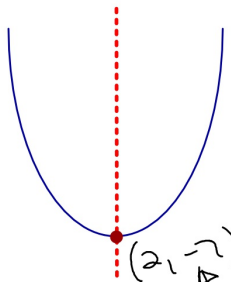
Does each quadratic function have a maximum or a minimum?

opens up
$y = 0.02x^2 + 6x - 21$ → Min.

opens down
$y = -45x^2 + x + 209$ → max

opens down
$y = 51x - x^2 + 34$ → Max

$y = 2x^2 - 8x + 1$

LOS: x = 2

State the minimum value of
this quadratic function. → y-coord

-7

When does this minimum → x-coord
value occur?

2

$(2, -7)$

$2(2)^2 - 8(2) + 1$

$2(2)^2 - 16 + 1$
   8