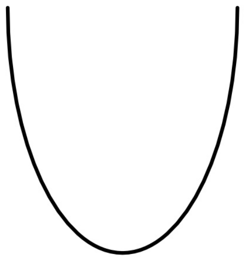
What do we call this graph? Parabola

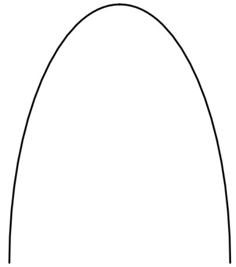


What equation gives this graph?

Quadratic $\underbrace{y = ax^2 + bx + c}_{\text{Standard Form of a Quadratic Function}}$

Vertex

The Highest or Lowest point on a Parabola. (depending on which way it opens)



Line of Symmetry (LOS)

Fold line that divides to the parabola into two matching halves

VERTICAL line that passes through the middle of the parabola

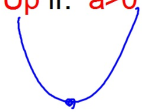
EQ: $x = \#$

VERTICAL line that passes through the Vertex.

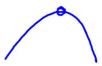
The Vertex is the only point of a Parabola that is ON the LOS

Quadratic Equation: $y = ax^2 + bx + c$

Parabola opens Up if: $a>0$ ⟶ Vertex is a Minimum



Parabola opens Down if: $a<0$ ⟶ Vertex is a Maximum



Does each parabola open up or down?

1. $y = -2.5x^2 + 38x + 106$ Down

2. $f(x) = 0.31x^2 - 80x - 57$ up

3. $y = 61x^2 + 1$ up

Every parabola has either a Maximum or a Minimum.

Does each parabola have a Max or a Min?

A. $y = 2x^2 + 2x + 1$ min

B. $y = -3x^2 + 8x - 4$ max

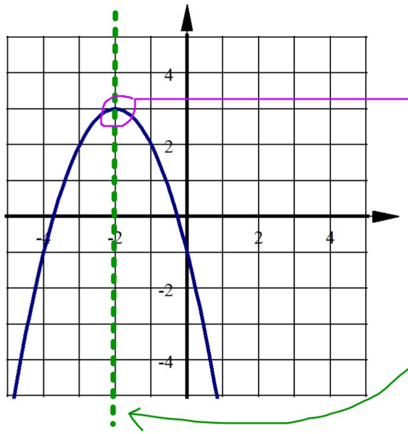
C. $y = 7x^2 - 10x - 3$ min

Does each parabola have a Maximum or a Minimum?

1. $f(x) = 16x^2 - 8x + 11$ min

2. $y = -1.609x^2 + 13x + 3$ max

3. $y = -x^2 - 2.4x - 0.75$ max

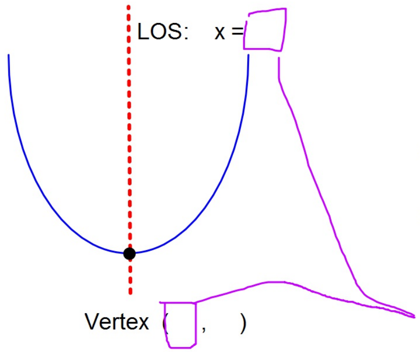


What are the coordinates of the Vertex?

(-2,3)

What is the equation of the Line of Symmetry?

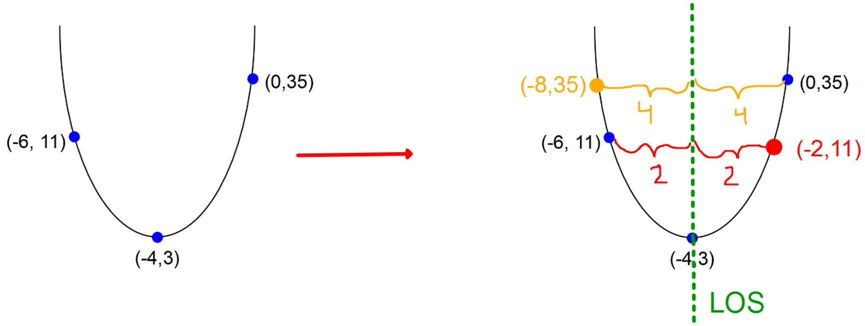
x = -2



How are the coordinates of the Vertex and the equation for the Line of Symmetry related?

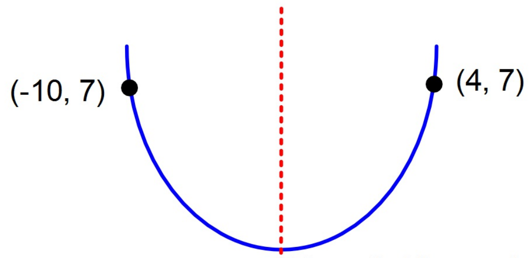
these are always the same

the x-coordinate of the Vertex is the same as the equation for the LOS.



Find the coordinates of two other points on this parabola.

What is the equation for the Line of Symmetry?



The vertical line exactly in the middle of these two points would be:

x = -3

the # in the middle of two other numbers is their average:

$\frac{-10+4}{2} = \frac{-6}{2} = -3$

The vertex of a parabola is (15,-8)

What is the equation of the Line of Symmetry?

LOS: Vertical Line through the Vertex

X = 15

Given the Quadratic Function $y = -2x^2 + 12x - 7$

The equation for the Line of Symmetry is x = 3

Find the coordinates of the vertex. $\boxed{(3,11)}$

$y = -2(3)^2 + 12(3) - 7$

Graphs of a parabolas Exploration

Do part 1

Part 1 Changing the size of a

In Y_2 try graphing $y = ax^2$ with different values of a, but keeping it positive.
Notice what happens to the graph when you change the size of a.

How does the size of a affect the shape of the graph?

The larger the value of a ...... the more narrow the parabola.

The smaller the value of a ..... the wider the parabola.

Actually the parabolas don't get wider or narrower

they get taller and shorter.....

a is a Vertical Stretch or Vertical Shrink Factor

Since our textbook uses the terms WIDE and NARROW
that is how we will refer to it.

If you take the absolute value of a:

The smaller |a| is the wider the parabola shorter

The larger |a| is the more narrow the parabola taller

Finish this sentence: The closer the value of a is to zero the __Wider__ the parabola.

Finish this sentence: The further the value of a is from zero the __Narrower__ the parabola.

13. Place the following quadratics in order from widest to narrowest.

A. $y = -4x^2 + 6x - 9$

B. $y = x^2 - 8x + 17$

C. $y = 0.15x^2 + 3x - 1$

D. $y = -9x^2 - 10x + 5$

E. $y = -0.5x^2 + 4x + 30$

C E B A D

WIDE → NARROW

Place these in order from Widest to Narrowest.

A. $y= -6x^2$

B. $y= 7x^2$

C. $y= 0.37x^2$

D. $y= -0.41x^2$

E. $y= -x^2$

Widest

C. $y= 0.37x^2$

D. $y= -0.41x^2$

E. $y= -x^2$

A. $y= -6x^2$

B. $y= 7x^2$

Narrowest

Now do Part 2 of the Exploration

Part 2 Changing the value of c.

In Y_2 try graphing $y = x^2 + c$ for different values of c, both positive and negative.
Notice what happens to the location of the graph when you change the value of c.

How does the value of c affect the location of the graph?

The value of c shifts the graph up or down:

+c moves it up c units
-c moves it down c units