Parabolic Functions

Parabolic Function

Parabolic function is a function of the form f(x) = ax2 + bx + c, and if presented in a two dimensional graphical form, it has a shape of a parabola. The equation representing a parabolic function is a quadratic equation with a second degree in x.

Let us learn more about the parabolic function, graph of a parabolic function, properties of parabolic function with the help of examples, FAQs.

What Is A Parabolic Function?

Parabolic function is a function of the form f(x) = ax2 + bx + c. It is a quadratic expression in the second degree in x. The parabolic function has a graph similar to the parabola and hence the function is named a parabolic function.

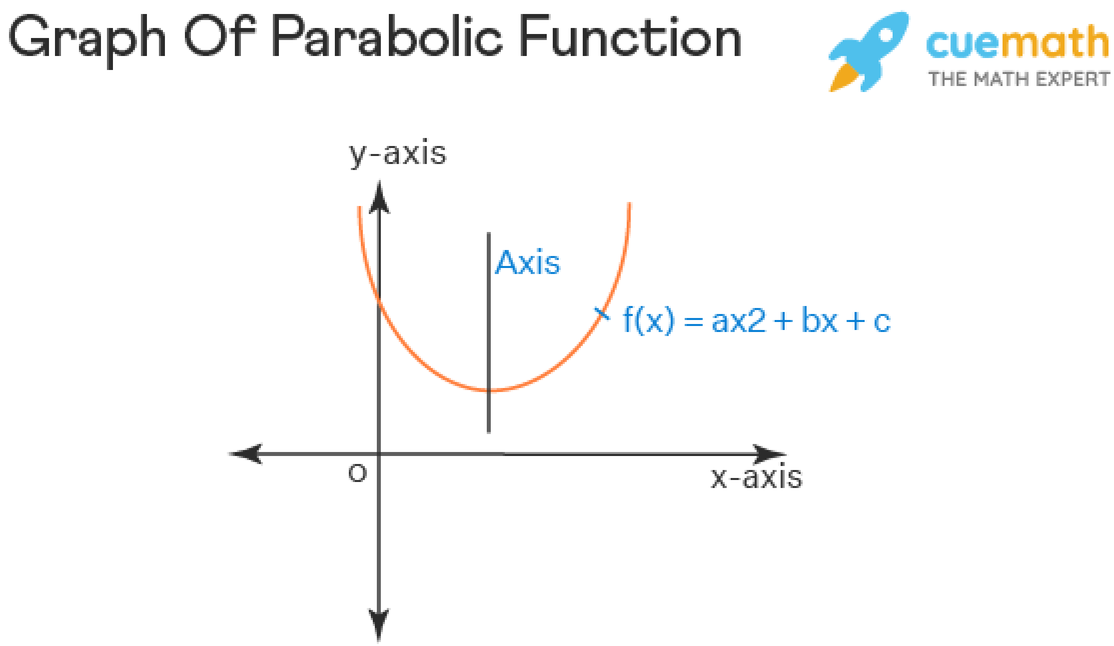
Parabolic Function

$$\boxed{f(x) = ax^2 + bx + c}$$

The parabolic function has the same range value for two different domain values. The general form of a parabolic function f(x) = ax2 + bx + c has one f(x) value or y value for two value of x, which are x1, x2. The two possible points on the graph of the parabolic function is (x1, y), (x2, y). Hence the parabolic function can also be termed as a many to one function.

Graph Of Parabolic Function

The graph of a parabolic function is similar to a parabola. The graph of a parabola follows the basic definition of a parabola. A parabola is a locus of a point such that it is equidistant from a fixed point called the focus and the fixed-line called the directrix.



The graph of a parabolic function is symmetric to a straight line, and this line is called the axis of the parabola. The axis of a parabola can be a line parallel to any of the coordinate axis or it can be a line, inclined at an angle with the coordinate axis.

Properties of Parabolic Function

The following are some of the important properties of the parabolic function, which are helpful in a better understanding of this function.

- The parabolic function has the same codomain for two different domain values.
- The set of two points that satisfy the parabolic function equation have different abscissa and the same ordinate.
- The domain of the parabolic function can be positive or negative values, but the range of the parabolic is a positive value.
- The parabolic function can also be termed as many one functions.
- The graph of a parabolic function is symmetric about a line, and this line is called the axis of the parabola.
- The equation representing the parabolic function satisfies all the properties of a geometric parabola.

Graphing Parabola Solved Examples

Example 1:

Draw a graph for the equation $y = 2x2 + x + 1$.

Solution:

The given equation is $y = 2x2 + x + 1$.

Here, $a = 2$, $b = 1$ and $c = 1$.

It needs to find the vertex now

$x = -b/(2a)$

$x = -1/(2(2))$

$x = -1/ 4$

$x = -0.25$

Now putting $x = -0.25$ in the equation $y= 2x2 + x+ 1$

$y= 2(-0.25)2 + (-0.25)+ 1$.

$y = 2(0.0625) - 0.25+1$

$y = 0.125 - 0.25 +1$

$y = 0.875$

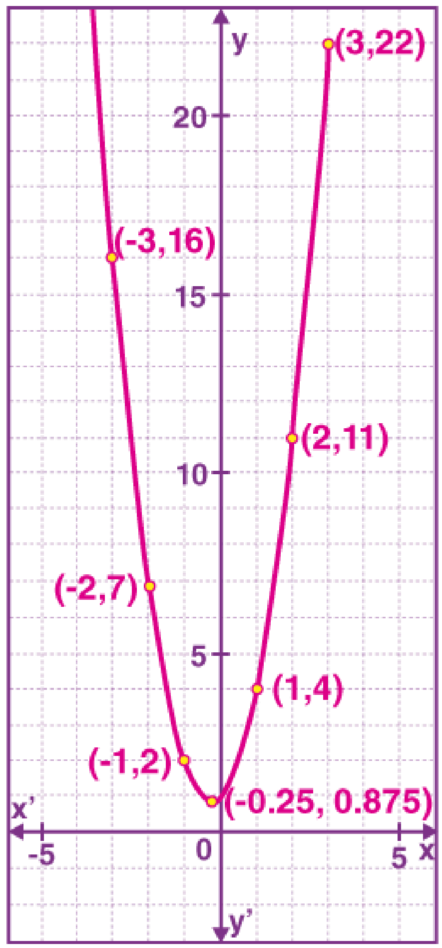
Now putting the different values for x and calculate the corresponding values for y.

- When $x = 1 \Rightarrow y= 2x2 + x+ 1 \Rightarrow y = 2(1)2+ 1 + 1 \Rightarrow y = 2+ 1 + 1 \Rightarrow y = 4$
- When $x = 2 \Rightarrow y= 2x2 + x+ 1 \Rightarrow y = 2(2)2+ 2 + 1 \Rightarrow y = 8+ 2 + 1 \Rightarrow y = 11$
- When $x = 3 \Rightarrow y= 2x2 + x+ 1 \Rightarrow y = 2(3)2+ 3 + 1 \Rightarrow y = 18+ 3 + 1 \Rightarrow y = 22$
- When $x = -1 \Rightarrow y= 2x2 + x+ 1 \Rightarrow y = 2(-1)2- 1 + 1 \Rightarrow y = 2- 1 + 1 \Rightarrow y = 2$
- When $x = -2 \Rightarrow y= 2x2 + x+ 1 \Rightarrow y = 2(-2)2- 2 + 1 \Rightarrow y = 8- 2 + 1 \Rightarrow y = 7$
- When $x = -3 \Rightarrow y= 2x2 + x+ 1 \Rightarrow y = 2(-3)2- 3 + 1 \Rightarrow y = 18 -3 + 1 \Rightarrow y = 16$

Hence,

x	1	2	3	-1	-2	-3
y	4	11	22	2	7	16

Plot all the points and join the plotted points.



Example 2:

Draw a graph for the equation y = 2x2.

Solution:

The given equation is y= 2x2.

Here a = 2, b = 0 and c = 0.

It needs to find the vertex now

x = -b/(2a)

x = 0

Now putting x = 0 in the equation y= 2x2.

y= 2x2

y = 2(0)2

y = 0

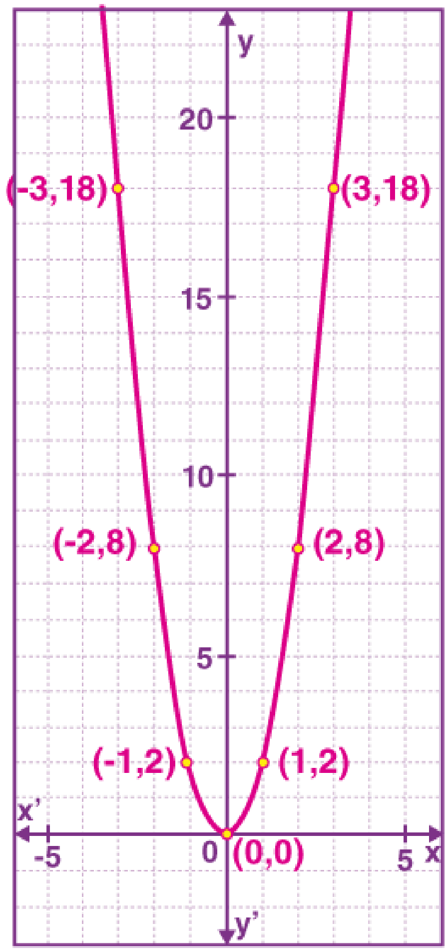
Now putting in different values for x and calculate the corresponding values for y.

- When x = 1 ⇒ y= 2x2⇒ y = 2(1)2 ⇒ y = 2
- When x = 2 ⇒ y= 2x2⇒ y = 2(2)2⇒ y = 8
- When x = 3 ⇒ y= 2x2⇒ y = 2(3)2⇒ y = 18
- When x = -1 ⇒ y= 2x2⇒ y = 2(-1)2⇒ y = 2
- When x = -2 ⇒ y= 2x2⇒ y = 2(-2)2⇒ y = 8
- When x = -3 ⇒ y= 2x2⇒ y = 2(-3)2⇒ y = 18

Hence,

x	1	2	3	-1	-2	-3
y	2	8	18	2	8	18

Plot all the points and join the plotted points.



Yes! Since this is a parabolic function, let's solve it in a very simple way:

The given function is:

f(x)=−(x−3)2+9f(x) = - (x - 3)^2 + 9f(x)=−(x−3)2+9

We want to find xxx when f(x)=9f(x) = 9f(x)=9:

9=−(x−3)2+99 = - (x - 3)^2 + 99=−(x−3)2+9

Step-by-Step Simplified Solution

1 **Subtract 9 from both sides:**

0=−(x−3)20 = - (x - 3)^20=−(x−3)2

2 **Multiply by -1 to remove the negative sign:**

(x−3)2=0(x - 3)^2 = 0(x−3)2=0

3️⃣ **Take the square root on both sides:**

x−3=0x - 3 = 0x−3=0

4️⃣ **Solve for xxx:**

x=3x = 3x=3

Conclusion:

The maximum value **9** occurs at **x=3x = 3x=3** because the function is a **downward-facing parabola** with its peak at x=3x = 3x=3. ✅