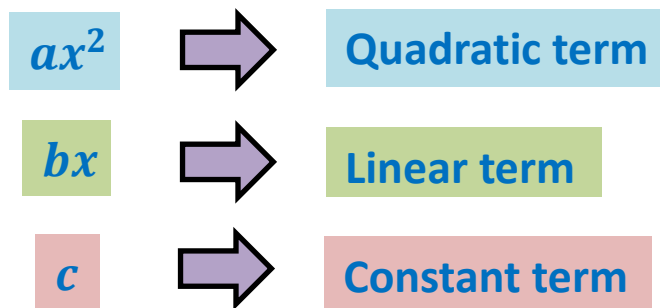


Quadratic Functions Guided Notes

A **quadratic** function is of the form:

$$ax^2 + bx + c$$

Where, $a \neq 0$.



Consider the quadratic function $(x) = ax^2 + bx + c$, $a \neq 0$.

- **Axis of Symmetry** is the line that divides the graph of the quadratic function into two parts that are mirror images of each other.
Mathematically, it is given as:

$$x = -\frac{b}{2a}$$

- **Vertex of the parabola** is the point which intersects the axis of symmetry of the graph of the quadratic function.
Mathematically, its coordinates are given as:

$$\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$$

Quadratic Functions Guided Notes

Problem 1: Identify the axis of symmetry and the vertex of the graph of the quadratic equation $f(x) = 2x^2 + 8x - 4$.

First find the axis of symmetry, here $a = 2$, $b = 8$:

$$x = -\frac{b}{2a} \quad \Rightarrow \quad x = -\frac{8}{2(2)} \quad \Rightarrow \quad x = -2$$

Now put this value of x in the equation of the quadratic function:

$$f(-2) = 2(-2)^2 + 8(-2) - 4 \quad \Rightarrow \quad f(-2) = 8 - 16 - 4$$

$$\Rightarrow \quad f(-2) = -12$$

$$\Rightarrow \quad \text{Vertex} = (-2, -12)$$

Graphing quadratic Functions

If we can find the vertex and axis of symmetry, we can use them to graph the quadratic functions. Graphing can be done by following these steps:

- Find the equation of axis of symmetry.
- Find the vertex of the quadratic function.
- Graph the vertex and axis of symmetry.
- Find 2 or 3 points on the graph and plot them.
- Use the axis of symmetry to complete the graph.

Problem 2: Graph the quadratic function $f(x) = 2x^2 - 4x + 2$.

- First find the axis of symmetry, here $a = 2$, $b = -4$:

$$x = -\frac{b}{2a} \quad \Rightarrow \quad x = -\frac{-4}{2(2)} \quad \Rightarrow \quad x = 1$$

Quadratic Functions Guided Notes

- Now put this value of x in the equation of the quadratic function:

$$f(1) = 2(1)^2 - 4(1) + 2$$



$$f(1) = 2 - 4 + 2 = 0$$



$$f(1) = 0$$



$$\text{Vertex} = (1, 0)$$

- Find two more points on the function:

$$f(0) = 2(0)^2 - 4(0) + 2$$



$$f(0) = 2$$



$$(0, 2)$$

$$f(-1) = 2(-1)^2 - 4(-1) + 2$$

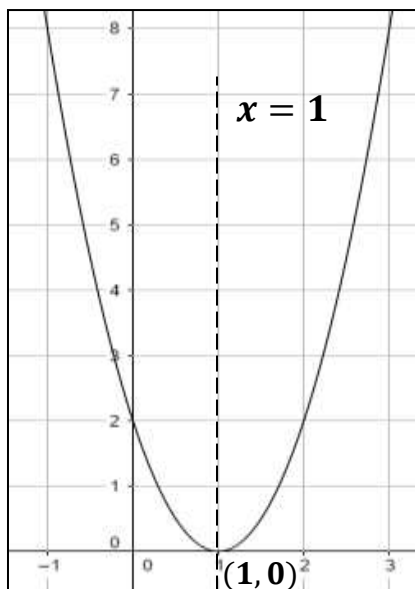


$$f(-1) = 8$$



$$(-1, 8)$$

- Now plot all these points and use the axis of symmetry to complete the graph.



$$f(x) = 2x^2 - 4x + 2$$