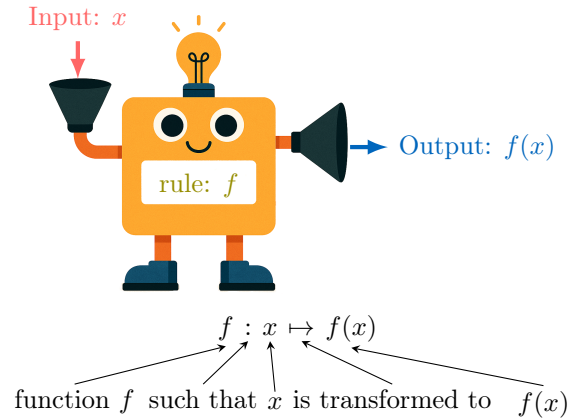


FUNCTIONS

A DEFINITIONS

Definition Function

From an input value x , a **function** f produces an output value $f(x)$.
We can write:



- $f(x)$ is read as " f of x ".
- $f(x)$ is called the **image** of x .

Ex: For $f(x) = 2x - 1$ (the function that doubles the input and subtracts 1), find $f(5)$.

Answer: $f(5) = 2 \times (5) - 1$ (substituting x by (5))
 $= 9$

B TABLES OF VALUES

Definition Table of Values

The **table of values** for a function f provides a listing of pairs $(x, f(x))$, where x is an input value and $f(x)$ is the corresponding output value produced by the function f .

Ex: For $f(x) = x^2$, complete the following table:

x	-2	-1	0	1	2
$f(x)$					

Answer:

- $f(-2) = (-2)^2$ (substituting x by (-2))
 $= 4$
- $f(-1) = (-1)^2$ (substituting x by (-1))
 $= 1$
- $f(0) = (0)^2$ (substituting x by (0))
 $= 0$
- $f(1) = (1)^2$ (substituting x by (1))
 $= 1$
- $f(2) = (2)^2$ (substituting x by (2))
 $= 4$

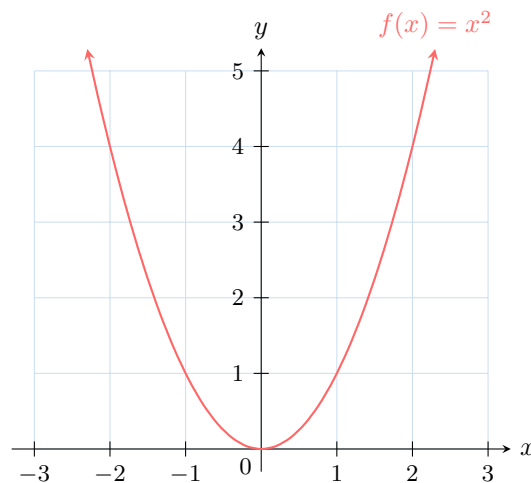
So the completed table is:

x	-2	-1	0	1	2
$f(x)$	4	1	0	1	4

C GRAPHS

Definition Graph

A **graph** of a function is the set of all points $(x, f(x))$ in the plane, where x is an input and $f(x)$ is its output.



Method Plotting a Line Graph from a Table

To plot the graph of a function from a table of values, follow these steps:

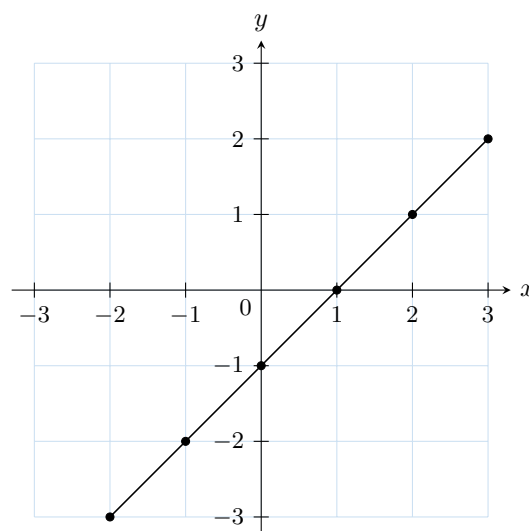
- Plot each point $(x, f(x))$ from the table onto the coordinate plane.
- Connect the points with straight line segments.

Ex: Here is a table of values for the function $f(x) = x - 1$:

x	-2	-1	0	1	2	3
$f(x)$	-3	-2	-1	0	1	2

Plot the line graph of f .

Answer: Plot the points $(-2, -3)$, $(-1, -2)$, $(0, -1)$, $(1, 0)$, $(2, 1)$, and $(3, 2)$. Then, connect the points with straight segments to form the line graph.

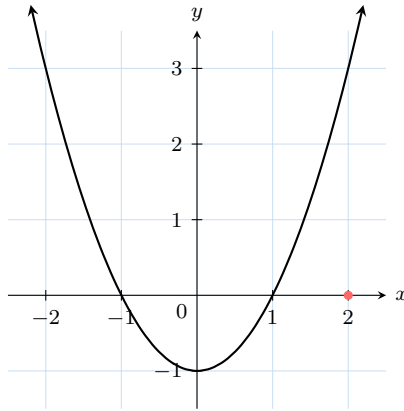


D READING VALUES AND SOLVING $f(x) = y$ ON A GRAPH

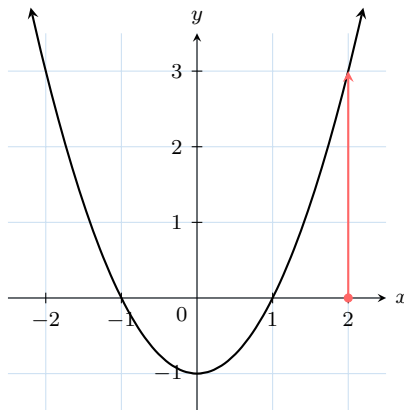
Method Finding the value $f(x)$ using a graph

To find $f(2)$ on a graph, follow these steps:

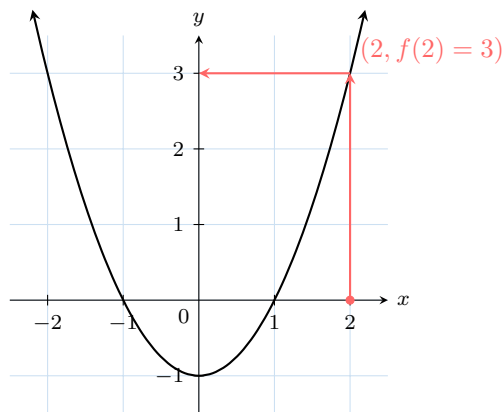
1. **Locate the x -value:** Find $x = 2$ on the x -axis.



2. **Move vertically to the curve:** From $x = 2$, draw a vertical line up to the graph.



3. **Read the y -value:** At the intersection with the curve, move horizontally to the y -axis to find the value $f(2)$.

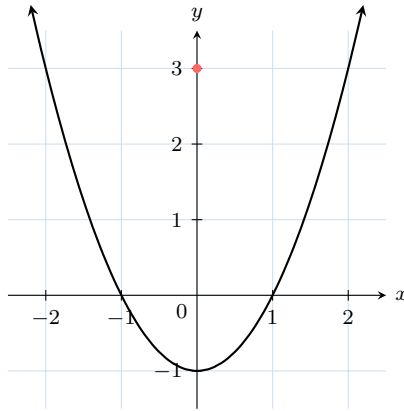


Thus, $f(2) = 3$.

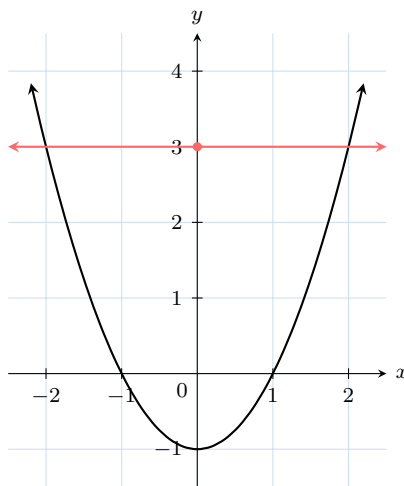
Method Finding x such that $f(x) = y$ using a graph

To find x where $f(x) = 3$ on this graph:

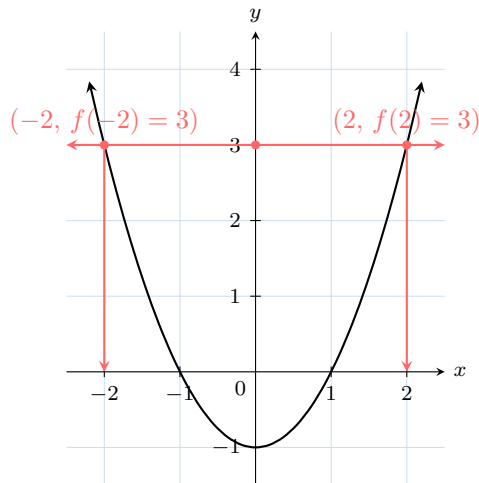
1. **Locate the y -value on the y -axis:** Find 3 on the y -axis.



2. **Draw horizontally to the graph of the function:** Draw a horizontal line from $y = 3$ to the curve.



3. **Read the x -values:** From the intersection points, draw vertical lines down to the x -axis and read the corresponding x -values.



Thus, the values of x for which $f(x) = 3$ are $x = 2$ and $x = -2$.

E SOLVING $f(x) = y$ ALGEBRAICALLY

Method Solving $f(x) = y$ algebraically

To find x such that $f(x) = y$:

- Write the equation $f(x) = y$.
- Solve for x using algebraic methods (e.g., inverse operations, isolating x).

Ex: Let $f(x) = 3x + 12$. Find all x such that $f(x) = 0$.

Answer: We solve the equation:

$$\begin{aligned}f(x) &= 0 \\3x + 12 &= 0 \\3x + 12 - 12 &= 0 - 12 \quad (\text{subtract 12 from both sides}) \\3x &= -12 \\\frac{3x}{3} &= \frac{-12}{3} \quad (\text{divide both sides by 3}) \\x &= -4\end{aligned}$$

So the solution is $x = -4$.

We can check this by calculating $f(-4)$:

$$f(-4) = 3 \times (-4) + 12 = -12 + 12 = 0$$

So $f(-4) = 0$, as expected.