

1. Why are graphs important in mathematics?

Graphs help us see and understand how different things are related to each other.

They are very useful in explaining mathematical functions and how these functions work in real-life situations.

2. What is a function in mathematics?

A function represents a relationship between two variables, where one variable depends on the other. It can be expressed as an equation, a graph, a numerical table, or a verbal description.

A function is written as:

$$y = f(x)$$

Here:

- f is the function
- x is the *independent variable* (input)
- y is the *dependent variable* (output)

3. What is a linear function?

A linear function shows a straight-line relationship between two variables. Its general form is:

$$\begin{aligned} f(x) &= mx + c \\ y &= mx + c \end{aligned}$$

Where:

- m is the *slope* (gradient) of the line
- c is the *y-intercept* (where the line crosses the *y-axis*)

4. What is a quadratic function?

A quadratic function is a type of polynomial function that includes the term x^2 . The general form of a quadratic function is:

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

Where a , b , and c are *constants* and $a \neq 0$.

Note: The graph of a quadratic function is always a *parabola*.

- If $a > 0$, the parabola **opens upward** like "U"
- If $a < 0$, the parabola **opens downward** like "∩"

5. What is the graph of a cubic function?

A cubic function is a type of polynomial function of degree 3. Its standard form is:

$$y = ax^3 + bx^2 + cx + d$$

Where a , b , c and d are *constants* and $a \neq 0$.

Note:

- (i) The graph of a cubic function is a **curve** that can have at most **two** turning points.
- (ii) It generally has an **S-shaped** appearance.
- (iii) Depending on the values of the constants, the shape may *vary*.
- (iv) Cubic functions are more **complicated** and show **more varied behaviour** than linear and quadratic ones.

6. What is the graph of a reciprocal function?

A reciprocal function is a function of the form:

$$y = \frac{a}{x}$$

Where a is any real number and $x \neq 0$.

Note: An asymptote is a line that a graph approaches but never touches.

7. What is the graph of an exponential function?

An exponential function is a mathematical function of the form:

$$y = ka^x$$

Where a, k are constants, x is a variable, and $a > 1$.

8. What is the gradient of a curve?

The **gradient or slope** of a graph at any point is equal to the gradient of the **tangent** to the curve at that point. The **gradient between two points** is defined as:

$$\begin{aligned} \text{Gradient} &= \frac{\text{Change in } y}{\text{Change in } x} \\ &= \frac{\Delta y}{\Delta x} \\ &= \frac{y_2 - y_1}{x_2 - x_1} \end{aligned}$$

Note: A *tangent* is a line that just touches a curve only at one point (and doesn't cross it).

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