Elementary Mathematics.

→ **Function:** A relation from a set of input to a set of outputs is a function.

* It is like machine that has an input & an output & the output is somehow related to the input.

* 3 parts of functions:
  a) input b) relationship c) output

  e.g., Multiply by '2' is a very simple function.

Input	Relationship	Output
0	×2	0
1	×2	2
7	×2	14
10	× 2	20
....	....	....

or

"A relation or expression involving one or more variables is a function."

Examples:-

1) Volume (variable) of gas depends upon 'T' (variable) at given 'P' → constant

2) Dipole moment depends upon polarity

3) The height of child grows with age.

4) Rate constant 'k' increases with 'T'

→ Explain the concept of dependent & Independent variables.

Mathematically:

$y = x + 1$ if $x = 1, 2, 3$

$y = 1 + 1 = 2$ $y = 2+1 = 3$

So, value of 'y' depends upon 'x' & x is independent variable but 'y' is dependent.

Representation of function:-

$y = f(x)$ function of 'x'

→

→ one 'x' value only gives one y value

So, $y^2 = x$ is not a function

bcz if $x = 16$ then $y = +4, -4$

e.g., $y^2 = f(x)$ $\quad \because x = 16$

$\sqrt{y^2} = \sqrt{16}$

$y = \pm 4$

So, $y = x$ is possible

but $y^2 = x$ is not possible as function

$y = f, g, h$ may also represent.

→ Domain & Range of Function:

Domain: Set of all possible ~~va~~ input values of independent variable (x) which is shown on x-axis.

Range: Set of all possible output values of dependent variables (y) which is shown on y-axis.

⇒ Types of Functions

1) Linear Function:-

Those functions whose graph is a straight line.

A linear function has one dependent & one independent variables.

$$Y = mx + c$$

$y =$ dependent variable

$x =$ Independent variable

$c =$ constant / intercept

$m =$ coefficient of independent variable.

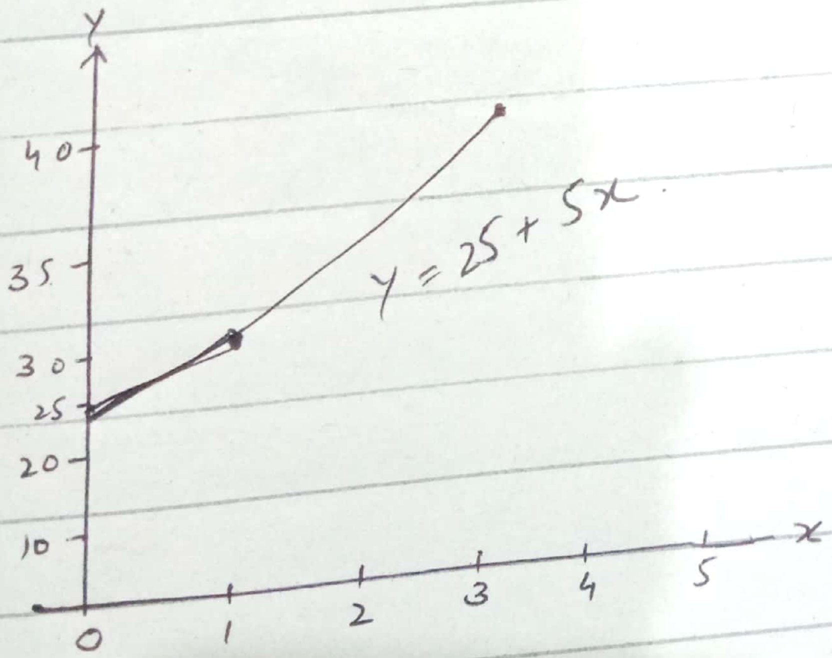
It is also known as slope & gives the rate of change of dependent variable.

→ **Graph:**

$Y = 25 + 5(x)$ let $x = 1$

$Y = 25 + 5(1) = 30$

$Y = 25 + 5(3) = 40$ let $x = 3$



2) **Quadratic Function:**

$$y = x^2 + c \quad \text{(parabolic curve)}$$

3) **Single valued Function:** is one in which a single value of x results in a single value of y.

one value of $x_1 = y_1$

(both have one value)

4) **Many valued Function:** is one in which a single value of x results in more than one value of 'y' e.g.,

$$y^2 = x \quad \text{(possible)} \ (\pm)$$

5) **Function of many variables:-**

$$PV = nRT$$

$$P = \frac{nRT}{V}$$

$\therefore$ R = constant but

T, V, n are many variables.

Exponential Function:-

"Some constant power variables functions"

"A function whose value is constant raised to the power of independent variable"

$$y = b^x$$ 'b' is base

'x' is in exponent is exponential function.

$\therefore$ $b \neq 0$

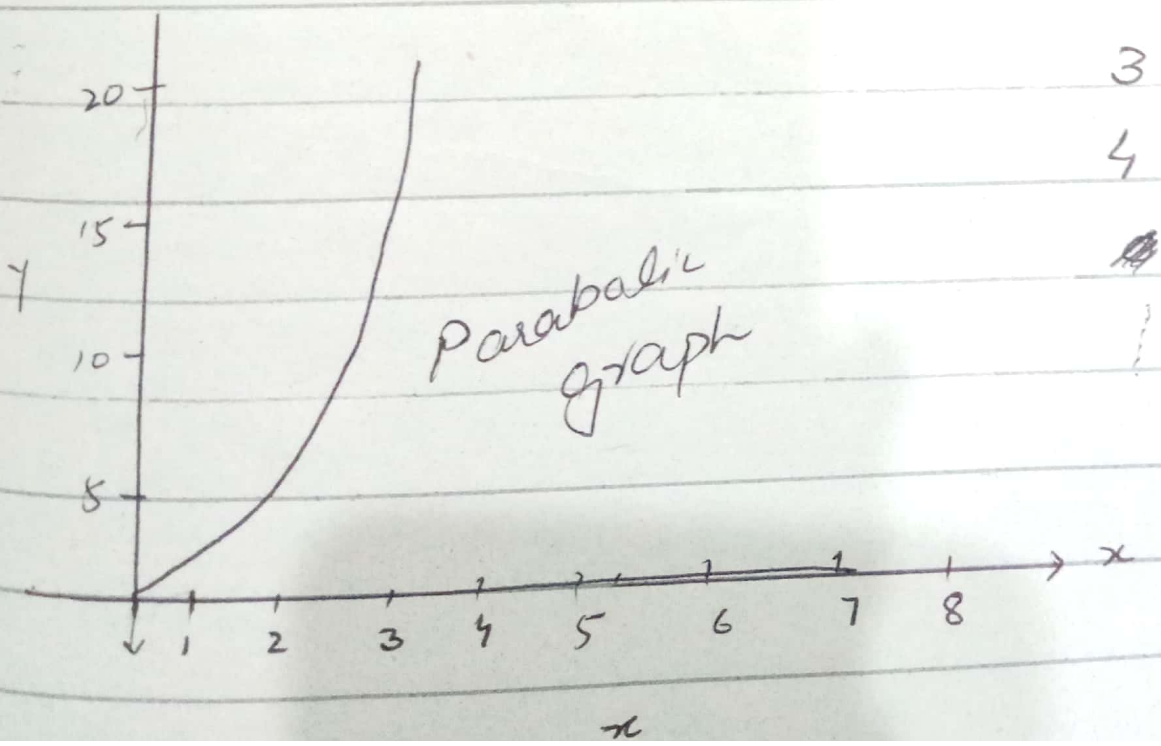
$b > 0$

$b > 1$

$y = 2^x$ and x is

$\boxed{\text{if } y = 0^1 = 0 \text{ so } b \neq 0}$

x	y
1	2
2	4
3	8
4	16
⋮	⋮



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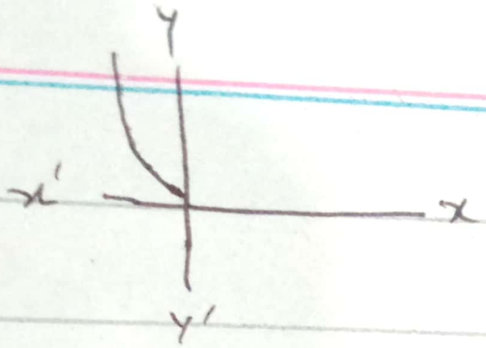
if $y = 2^{-x}$



Representation: $y = 10^x, a^x, e^x$

Mostly we use e^x in Chemistry.

Example:

population growth

A Polynomial Function:

A function which involves only non-negative integer powers.

e.g., $y = ax^3 + bx^2 + cx + c$

It has powers 3, 2, 1 & so on.

but power cannot be a negative integer.

$f(x) = 3x^3 + 4x + 1$ is polynomial

but $f(x) = 5x^3 + 2x - \frac{1}{x}$ is not a polynomial

because $5x^3 + 2x - x^{-1}$

→ Find the value of 'x'

$$\left(\frac{3}{4}\right)^x = \frac{16}{9}$$

$\frac{16}{9} = \left(\frac{4}{3}\right)^2$ but we have $\left(\frac{3}{4}\right)$ so

x must be -2 $\left(\frac{4}{3}\right)^{-2}$

Take another example.

$$3^{x-2} = 4^{2x+1}$$

$$3^{x-2} = 4^{2x+1}$$

Take a log on both sides so exponent becomes base.

1) $\log 3^{x-2} = \log 4^{2x+1}$

2) $(x-2)\log 3 = (2x+1)\log 4$

3) $x\log 3 - 2\log 3 = 2x\log 4 + \log 4$

4) $x\log 3 - \log 3^2 = x\log 4^2 + \log 4$

5) $x\log 3 - \log 9 = x\log 16 + \log 4$

6) $x\log 3 - x\log 16 = \log 4 \underset{\text{multiply}}{+} \log 9$

7) $x(\log 3 - \log 16) = \log 36$

8) $x\left(\log \frac{3}{16}\right) = \log 36$

9) $x = \dfrac{\log 36}{\log \frac{3}{16}} = \dfrac{1.556}{-0.726} = -2.1407$