Hamromaster
सुनौलो भविष्य हातमा **Hamromaster** को साथमा

Hamromaster

COMPLETE NOTES

For Hamromaster Online Classes

Whatsapp: 9840842566

Hamromaster Hamromaster

9840842566 notes@hamromaster.com www.hamromaster.com

Before Jumping into Differential Eq^n

Some IMP Terms

1) Function:- It defines the relationship bet^n one variable (independent) with another variables (dependent).

e.g.:

i) $f(y) = x^2$

$f(y)$ → dependent variable

x → Independent variable.

ii) $A = \pi r^2$

A → dependent variable

π → constant

r → Independent variable

2) variable:- Alphabet / term that Represent unknown Number or quantity.

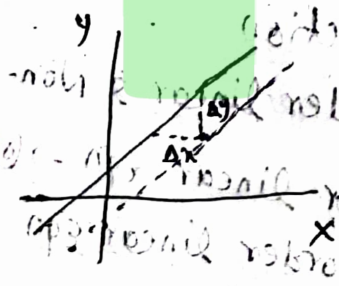
a) Independent variable → Independent to other variables.

b) dependent Variable → depended to other variables.

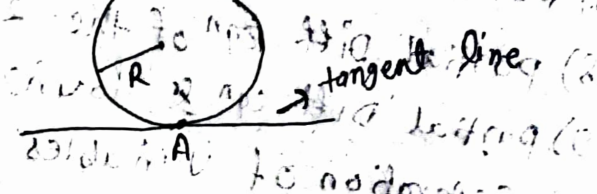
3) Slope:- slope is the measure of steepness of a line

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x}$$

$$\therefore \text{slope} = \frac{\Delta y}{\Delta x}$$



4) Tangent:- A line touching on curve at only one point



limit & Derivative concept :-

* Derivative :- Rate of change of a function w.r.to an independent variable. → slope of graph of function

eg.

$$\text{velocity }(v) = \frac{ds}{dt} \begin{matrix} \rightarrow \text{dependent variable} \\ \rightarrow \text{Independent variable} \end{matrix}$$

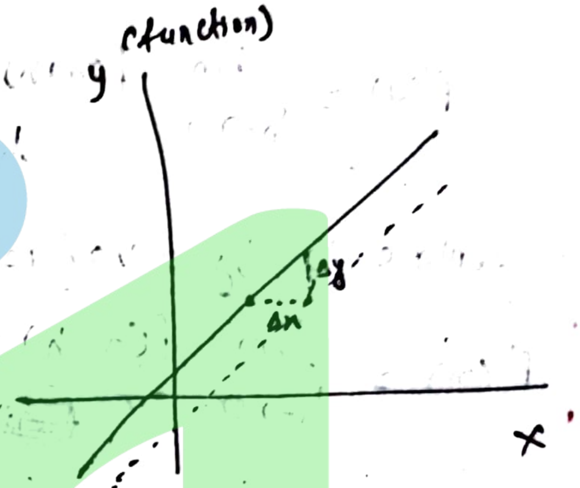
slope of straight line :-

→ slope is equal on every point of line as steepness is same

→ small change in $x \rightarrow \Delta x$
small change in $y \rightarrow \Delta y$

$$\text{slope} = \frac{\text{Change in } y}{\text{Change in } x} = \frac{\Delta y}{\Delta x}$$

$$\therefore \text{Derivative} = \frac{\Delta y}{\Delta x}$$



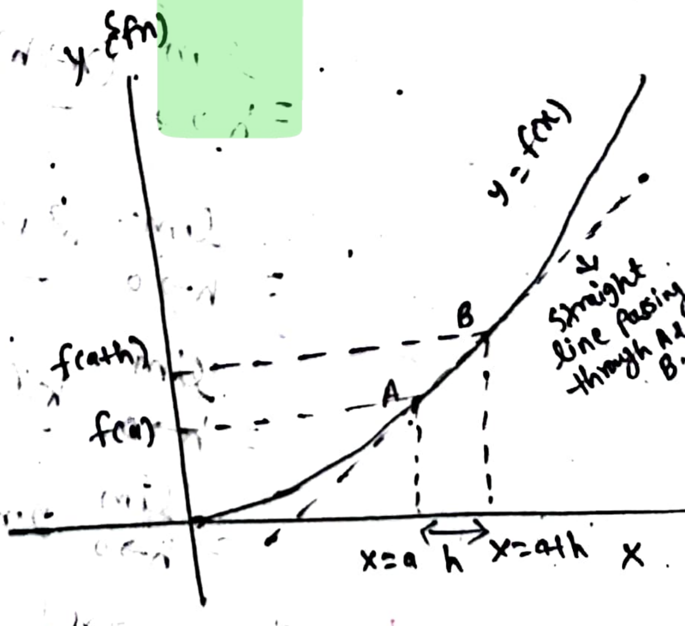
slope of curve :-

→ curve steepness is changing on each point → slope is changing.

→ lets assume two points A & B on curve & pass a straight line through these points such that it seems like straight line betn. point A & B.

$$\rightarrow \text{slope of the line} = \frac{\text{Change in } y}{\text{change in } x}$$

$$\therefore \text{slope} = \frac{f(a+h) - f(a)}{h}$$



→ It's not the slope of the curve as its the slope of the line betn A & B.

→ If we ~~place~~ moved the point B very near to A such that the line passing through A & B becomes a tangent line & the slope of this tangent gives the slope of curve.

i.e. we have to put limit, $h \to 0$,

Derivative of a function at a number 'a' denoted by $f'(a)$ is:

$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

let's Replace 'a' by a variable 'x' then,

$$\boxed{f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}}$$ → Derivative of $f(x)$

eg. Derivative of $f(x) = x^2$:-

→ solⁿ

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h \to 0} \frac{(x+h)^2 - x^2}{h} \quad [\because f(x) = x^2]$$

$$= \lim_{h \to 0} \frac{\cancel{x^2} + 2hx + h^2 - \cancel{x^2}}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{h}(2x+h)}{\cancel{h}}$$

$$= \lim_{h \to 0} 2x + h^{\nearrow 0}$$

$$\boxed{\therefore f'(x) = 2x}$$

Notes
- $h \neq 0$, $h \to 0$
- $\therefore \frac{h}{h} = 1 \neq \frac{0}{0}$
- $\therefore h^2, h^3, h^4 \to 0$
- $\therefore 1 + \cancel{h}^{0} + 1 \Rightarrow 2$
- → $h = 0.00000000{-}1$ [very very small]

Integrals & Integration

Integrals are the anti-derivatives & the process is called Integration.

eg. $\frac{d(\sin x)}{dx} = \cos x \Rightarrow$ Integration of $\cos x = \int \cos x \Rightarrow \sin x + c$

Why Integration?

① To find the function from Derivatives

e.g. Find the function of : $y' = 2x$

Sol^n $\frac{dy}{dx} = 2x \left[\because y' = \frac{dy}{dx}\right]$

or, $dy = 2x\,dx$

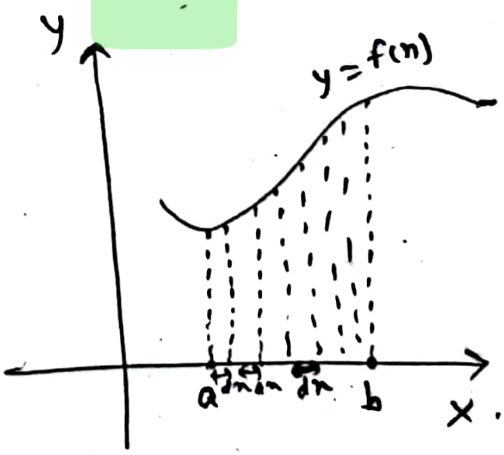
Integrating on both sides, we get

$\int dy = \int 2x\,dx$

$y = \frac{\cancel{2}x^2}{\cancel{2}}$

$\boxed{\therefore y = x^2}$

② To Find the area of curve



* Area of curve from point a to point b can be found via integration i.e

Area of curve from a to b $= \int_a^b f(x)\,dx$