* 'Variable': ~~Rep~~ Representation of a number, which may take different numerical values during a mathematical operation.

* Function: — Let $x \rightarrow$ independent variable defined by a set ~~of~~ X of its values

If for each value of x there corresponds one definite value of another variable y, then y is called the function of x with a domain X.

~~In math~~ In functional notation, we write

$$y = y(x) \quad \text{or} \quad y = f(x) \quad \text{or} \quad y = z(x) \quad \text{or}$$

$$y = \phi(x) \quad \text{etc}$$

→ The set of values of $y(x)$ is called the range of the given function.

H.W (1) Sketch the graph of trigonometric function — $\sin x$, $\cos x$, $\tan x$.

* Limit of a function :—

→ A point 'a' on the real axis is called the limit point of a ~~set~~ set X if any neighbourhood of the point 'a' contains points belonging to X which are different from 'a'.

When x approaches a constant quantity a from either side, there exists a definite finite number A towards which $f(x)$ tends. Such a numerical difference of $f(x)$ and A can be made as small as we can think by taking x sufficiently close to a.

Then A is defined as the limit of f(x) as x tends to a

In notational form: $\lim_{x \to a} f(x) = A$

<u>ε-δ definition</u> — A number 'A' is called the limit of a function f(x) as $x \to a$, $A = \lim_{x \to a} f(x)$, if for any $\epsilon > 0$ there exists a number $\delta(\epsilon) > 0$ such that for all x satisfying the inequality $0 < |x-a| < \delta$ and belonging to the domain of definition of the function f(x) the inequality ~~holds~~ $|f(x) - A| < \epsilon$ holds true.

<u>H.W.</u> ① Prove that $\lim_{x \to \infty} \sin x$ does not exists.

② Read Right Hand limit of a function & Left Hand Limit of a function.

* <u>Continuity</u>: For f(x) to be continuous at $x = a$, we should have

$$\lim_{x \to a^+} f(x) = \lim_{x \to a^-} f(x) = f(a)$$

⇒ If f(x) is continuous for every value of x in its domain, it is said to be continuous throughout the interval.

* <u>Definition of the Derivative</u>

The derivative $f'(x)$ $\left(=\frac{dy}{dx}\right)$ of the function $y = f(x)$ at a given point x is defined by

$$\frac{dy}{dx} = f'(x) = \lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x} = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$