Continuity & Differ.

Ex:- if $f(x) = \begin{cases} 1 & ; x \le 0 \\ 2 & ; x > 0 \end{cases}$ check conti. ?

Solⁿ:- ∵ at $\boxed{x=0}$ fun is conti if

$\Rightarrow \left[\lim_{x\to 0} f(x) = f(0)\right]$

or $\Rightarrow \left[\underbrace{\lim_{x\to 0^+} f(x)}_{RHL} = \underbrace{\lim_{x\to 0^-} f(x)}_{LHL} = f(0)\right]$

$\Rightarrow \lim_{x\to 0^+}(2) = \lim_{x\to 0^-}(1) = 1$

$\Rightarrow 2 \ne 1 = 1$

∵ LHL & RHL doesn't conside with each other.

∴ it is not conti. function Ans.

H.W. Ex:- $f(x) = \begin{cases} 1 & ; x \ne 0 \\ 2 & ; x = 0 \end{cases}$ check conti ?

$\Rightarrow$ RHL = LHL $\ne f(0)$

$\Rightarrow 1 = 1 \ne 2$

Ex:- Check $f(x) = 2x+3$ is conti. at $\boxed{x=1}$

Solⁿ:- ∵ fun is conti if $\left[\lim_{x\to 1} f(x) = f(1)\right]$

So: $\lim_{x\to 1}(2x+3) = 2(1)+3$

$\Rightarrow 2(1)+3 = 5 \Rightarrow \boxed{5=5}$ so it is conti.

H.W. Ex:- Check $f(x) = x^2$ is conti at $x = 0$.

Ex:- discuss conti of $f(x) = |x|$ at $x = 0$?

Solⁿ:- $f(x) = |x| \Rightarrow f(x) = \begin{cases} x & ; x \ge 0 \\ -x & ; x < 0 \end{cases}$

so it is conti if

LHL = RHL = $f(0)$

$\Rightarrow \lim_{x\to 0^-} f(x) = \lim_{x\to 0^+} f(x) = 0$

$\Rightarrow \lim_{x\to 0^-}(-x) = \lim_{x\to 0^+}(x) = 0 \Rightarrow (-0) = (0) = 0 = 0 = 0 = 0$

Continuity & Differ.

H.W.
Ex:- Check $f(x) = \begin{cases} x^2+3 & ; x \neq 0 \\ 1 & ; x = 0 \end{cases}$ is Conti?

Ex! Check the point where Constant fun. $\boxed{f(x) = K}$ ($\to \in R$) is Conti?

Soln: ∵ given that the fun. $f(x) = K$ is continuous.

let $\boxed{C \text{ be a point in Real no.}}$

so:- function is Conti at $\underline{C}$ if $\boxed{\lim_{x\to c} f(x) = f(c)}$

Sol $\lim_{x\to c}(K) = K$

$\Rightarrow \boxed{K = K}$

H.W. So the fun $f(x) = K$ is Conti at all real no. C. Ans

Ex:- prove that $\boxed{f(x) = x}$ is Continuous at all real no.

Ex:- Diss the Conti of fun.

$f(x) = \begin{cases} x^2+2 & ; x < 0 \\ 3 & ; x \geq 0 \end{cases}$

at $\boxed{x = 0}$.

Ex:- Examine the point where fun. is Conti.

i) $f(x) = \dfrac{1}{x-5}$; $[x \neq 5]$

Soln:- let c be a real no. where $\boxed{c \neq 5}$

So: $\lim_{x\to c} f(x) = f(c)$

$\Rightarrow \lim_{x\to c}\left(\dfrac{1}{x-5}\right) = \dfrac{1}{c-5} \Rightarrow \dfrac{1}{c-5} = \dfrac{1}{c-5}$

Continuity & Differen.

Ex:- if $f(x) = \begin{cases} x \ ; & x \le 1 \\ 5 \ ; & x > 1 \end{cases}$ then find Conti at $\boxed{x=0}$ & $\boxed{x=1}$ & $\boxed{x=2}$

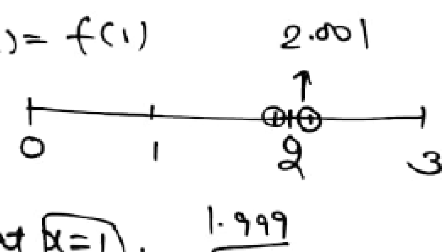
Solⁿ: i) when $\boxed{x=0}$ fun is Conti → if $\lim_{x\to 0} f(x) = f(0)$

$\Rightarrow \lim_{x\to 0}(x) = 0$

$\Rightarrow \boxed{0=0}$ → it is Conti at 0.

ii) at $\boxed{x=1}$ → if $\lim_{x\to 1^+} f(x) = \lim_{x\to 1^-} f(x) = f(1)$

$\Rightarrow \lim_{x\to 1^+}(5) = \lim_{x\to 1^-}(x) = (1)$



$\Rightarrow \boxed{5 \ne 1}$ → $\underline{LHL \ne RHL}$ so dis at $\boxed{x=1}$.

iii) at $\boxed{x=2}$:- $\lim_{x\to 2} f(x) = f(2)$

$\Rightarrow \lim_{x\to 2}(5) = 5$

$\Rightarrow 5=5$ → so Conti. Ans

LHL → $\lim_{x\to 2^-}(5) = 5$

RHL → $\lim_{x\to 2^+}(5) = 5$

Ex:- find all the points of dis Continuity of

$f(x) = \begin{cases} x+2 \ ; & x < 1 \\ 0 \ ; & x = 1 \\ x-2 \ ; & x > 1 \end{cases}$

Solⁿ:- $\boxed{x=1}$

$\Downarrow$

$\underline{LHL = RHL = f(1)}$