$$f(x) < f(2x) < f(3x)$$

$$\frac{f(u)}{f(u)} < \frac{f(2x)}{f(x)} < \frac{f(3x)}{f(x)}$$

$$\boxed{\lim_{x\to\infty} \frac{f(2x)}{f(x)} = 1}$$

$$\lim_{x\to\infty} \frac{f(cx)}{f(x)} = ? \qquad c > 0$$

$$0 < c < 1$$

$$\frac{1}{2^n} < c < \frac{1}{2^{n-1}}$$

$$\boxed{\lim_{x\to\infty} \frac{f\left(2^n \cdot \frac{x}{2^n}\right)}{f(x)} = 1} \qquad \lim_{x\to\infty} \frac{f(x)}{f\left(\frac{x}{2^n}\right)} = 1$$

$$Let \quad c > 1 \quad \Rightarrow \quad 2^{n-1} \leq c \leq 2^n$$

$$f\left(2^{n-1} x\right) < f(cx) < f(2^n x)$$

$$\lim_{x\to\infty} \frac{f(2^2 x)}{f(2x)} = 1 \qquad \lim_{x\to\infty} \frac{f(2^n x)}{f(2^{n-1} x)} = 1$$

$$\lim_{x\to\infty} \frac{f(2^3 x)}{f(2^2 x)} = 1$$

$$\sum_{K=1}^{15} K$$

$$x \left\{ \dfrac{K}{x} \right\}$$

$$\lim_{x \to 0} \quad x \times \dfrac{K}{x} - x \left\{ \dfrac{15}{x} \right\}$$

$$\downarrow 0$$

$$K$$

$$\boxed{\cot x - \cos x}$$

$$\dfrac{\cot x \left(1 - \sin x \right)}{\tan \left(\dfrac{\pi}{2} - x \right) \left(1 - \cos \left(\dfrac{\pi}{2} - x \right) \right)}$$
$$\dfrac{}{2^{0} \left(\dfrac{\pi}{2} - x \right) \left(\dfrac{\pi}{2} - x \right)^{2}}$$

1. 1

2. $[-2, 0)$

$D \leq 0.$

$K \in [-2, 2]$ ↑ $K^2 - 4 \leq 0$

3. ϕ $\geq 0 \; \forall \; K \in R$

$f(x) = \dfrac{\sqrt{x^2 + Kx + 1}}{x^2 - K} \neq 0$

$\boxed{K < 0} \checkmark$

cont. $\forall x \in R$ $\lim_{x \to 0}$ $K = ?$

1. $\lim_{x \to 0} \dfrac{e^x(e^x + e^{-x}) - (x+1)(e^x + e^{-x})}{x^2 \left(\dfrac{e^x - 1}{x}\right)}$

$\dfrac{(e^x + e^{-x})(e^x - x - 1)}{x^2} \left(\dfrac{e^x - 1}{x}\right) = 1$

3. $q(x) = \boxed{\cosec 2x + \cosec 2^2 x + \cosec 2^3 x + \cdots + \cosec 2^{n-1} x + \cosec 2^n x} + \cot 2^n x$

$\boxed{\cot 2^{n-1} x}$

$= \cot x$

$RHL = \lim_{x \to 0^+} \left((\cos x)^{\cot x} + (\sec x)^{\cosec x} + 1 \right) = 2 + 1 = 3$

$e^{\dfrac{(\cos x - 1) x}{x^2 \frac{\tan x}{x}}} + e^{\dfrac{(1-\cos x) x}{\cos x \cdot x^2 \frac{\sin x}{x}}}$

$\boxed{P = \phi}$

$LHL = \lim_{x \to 0^-} \dfrac{e^x + e^{-x} - 2 + 2(1 - \cos x)}{x^2 \cdot \frac{\sin x}{x}} = 2$

1. Let $f(x) = \lim\limits_{n \to \infty} \dfrac{x^{2n-1} + ax^2 + bx}{x^{2n} + 1} = \begin{cases} ax^2 + bx, & |x| < 1 \\ \dfrac{1}{x}, & |x| > 1 \\ \dfrac{1 + a + b}{2}, & x = 1 \\ \dfrac{-1 + a - b}{2}, & x = -1 \end{cases}$, $n \in N$ ✓

is continuous $\forall x \in R$, find a, b. ✓

Cont. At $x = 1$ ✓

$LHL = \lim\limits_{x \to 1^-} \dfrac{ax^2 + bx}{1} = a + b$

$RHL = \lim\limits_{x \to 1^+} \dfrac{1}{x} = 1$

$f(1) = \dfrac{1 + a + b}{2}$

$\boxed{a = 0, \ b = 1}$

$\boxed{a + b = 1}$

$\boxed{a - b = -1}$

At $x = -1$

$LHL = \lim\limits_{x \to -1^-} \cdot$ at

Cont. $x = -1$

$LML = -1$

$RML = a - b$

$f(-1) = \dfrac{a - b - 1}{2}$

2. Let $f(x) = $

$$\begin{cases} \dfrac{(a^x-1)}{x} \left(\dfrac{b\sin x - \sin bx}{x(\cos x - \cos bx)}\right)^n & , x > 0 \\ \\ \dfrac{\sin x}{x} & \\ \\ \dfrac{b \cancel{x}\, a^x \dfrac{\sin(bx)}{bx} - b^n \dfrac{\sin(ax)}{ax} a\cancel{x}}{b\cancel{x}\, \dfrac{\tan(bx)}{bx} - \dfrac{\tan(ax)}{ax} a\cancel{x}} & , x < 0 \end{cases}$$

$\displaystyle\lim_{x\to 0^-} \dfrac{\sin x}{x}$

$$\left(\dfrac{b\left(\dfrac{\sin x - x}{x^3}\right) + \left(\dfrac{bx - \sin bx}{(bx)^3}\right)b^3}{\left(\dfrac{\cos x - 1}{x^2}\right) + \left(\dfrac{1 - \cos bx}{(bx)^2}\right)b^2}\right)^n$$

$LHL = \dfrac{b-a}{b-a} = 1$

is continuous at $x = 0$. Obtain $f(0)$ and a relation between a, b & n.

$$\boxed{f(0) = 1 = \ell n\, a\left(\dfrac{b}{3}\right)^n}$$

$$\ell n\, a\left(\dfrac{-\dfrac{b}{6} + \dfrac{b^3}{6}}{-\dfrac{1}{2} + \dfrac{b^2}{2}}\right)^n$$

At $\boxed{5:45\ pm}$

1. Let $f(x+y) = f(x)f(y) \quad \forall \, x, y \in R$ and

$f(x) = 1 + g(x)G(x)$, where $\lim\limits_{x \to 0} g(x) = 0$ &

$\lim\limits_{x \to 0} G(x)$ exists. P.T. $f(x)$ is continuous

$\forall x \in R$.

cont. at $\underline{x = a}$ $\quad$ $a \in R$ $\boxed{LHL = RHL = f(a)}$ cont. at $x = a$.

$LHL = \lim\limits_{h \to 0} f(a-h) = f(a) \lim\limits_{h \to 0} f(-h) = f(a) \lim\limits_{h \to 0} \left(1 + g(-h)G(-h) \right)$

$0 \times$ finite

$RHL = \lim\limits_{h \to 0} f(a+h) = f(a) \lim\limits_{h \to 0} f(h) = f(a) \lim\limits_{h \to 0} \left(1 + g(h)G(h) \right) = f(a)$

$= f(a)$