Nishant Jindal

Q $\lim_{x\to 0} \dfrac{\tan^3 x+\tan^3 2x+\tan^3 3x}{\tan^3 4x+\tan^3 5x+\tan^3(6x)} = \dfrac{p}{q}$

$\dfrac{x^3+(2x)^3+(3x)^3}{(4x)^3+(5x)^3+(6x)^3} = \dfrac{1+8+27}{64+125+216}$

$= \dfrac{\cancel{36}\,4}{\cancel{405}\,45} = \dfrac{4}{45}$

Q $\lim_{x\to 0} \dfrac{\cos x-\sqrt{1+\sin^2 x}}{1-\sqrt{1+\tan^2 x}}$ $\quad \dfrac{0}{0}$

Rat.

$\lim_{x\to 0} \dfrac{\cos^2 x-1-\sin^2 x}{\cos x+\sqrt{1+\sin^2 x}} \times \dfrac{1+\sqrt{1+\tan^2 x}}{1-1-\tan^2 x} = \dfrac{2}{2}\lim_{x\to 0} \dfrac{1-\sin^2 x-1-\sin^2 x}{-\tan^2 x} = \dfrac{+2\,\sin^2 x}{+\sin^2 x} \times \boxed{\cos^2 x}$

$\cos x+\sqrt{1+\sin^2 x} \to 1+\sqrt{1+0}$, $\quad 1+\sqrt{1+\tan^2 x} \to 1+\sqrt{1+0}$

$= 2\times 1 = 2$

Q $\lim_{x\to \cot^{-1}(-1)} \dfrac{\tan^3 x-2\tan x-1}{\tan^5 x-2\tan x-1}$ $\quad x^3 \to 3x^2$

$\cot x \to -1$ $\quad \tan^3 x \to 3$

$x \to \dfrac{3\pi}{4}$ $\quad \dfrac{\boxed{\tan^3 x}-2\tan x-1}{\tan^5 x-2\tan x-1}$ $\quad \dfrac{0}{0}$ DL

$\dfrac{3\tan^2 x\sec^2 x-2\sec^2 x}{5\tan^4 x\cdot\sec^2 x-2\sec^2 x}$

$\lim_{x\to \frac{3\pi}{4}} \dfrac{\cancel{\sec^2 x}(3\tan^2 x-2)}{\cancel{\sec^2 x}(5\tan^4 x-2)} = \dfrac{3(-1)^2-2}{5(-1)^2-2} = \dfrac{1}{3}$

Nishant Jindal

Q $\lim_{\boxed{x\to\infty}} \sqrt{\dfrac{x - \sin x}{x + \cos^2 x}}$ — Algebric, Trigo

$\lim_{x\to\infty} \sqrt{\dfrac{x\left(1 - \frac{\sin x}{x}\right)}{x\left(1 + \frac{\cos^2 x}{x}\right)}}$

$\dfrac{\sin\infty}{\infty} = \dfrac{(-1 \text{ to } 1)}{\infty} = 0$

$\dfrac{\cos^2\infty}{\infty} = \dfrac{(0 \text{ to } 1)}{\infty} = 0$

$\sqrt{\dfrac{1-0}{1+0}} = 1$

Q $\lim_{x\to 0^+} \sqrt{\boxed{\dfrac{\tan^{-1}x}{x}} - \boxed{\dfrac{\sin^{-1}x}{x}}}$

1 से कम − 1 से ज़्यादा

$\sqrt{-ve} = \text{LDNE}$

Q If $l = \lim_{n\to\infty} \sum_{r=2}^{n} (r+1)\cdot\sin\frac{\pi}{r+1} - r\cdot\sin\frac{\pi}{r}$

then $\{l\} = ?$

all Subjective Ex

$3\sin\frac{\pi}{3} - 2\sin\frac{\pi}{2}$

$+ 4\sin\frac{\pi}{4} - 3\sin\frac{\pi}{3}$

$+ 5\sin\frac{\pi}{5} - 4\sin\frac{\pi}{4}$

$\vdots$

$+ (n+1)\sin\frac{\pi}{(n+1)} - n\sin\frac{\pi}{n}$

$\boxed{\infty\times 0}$

$\infty \times \sin 0$

$l = (n+1)\sin\frac{\pi}{n+1} - 2\sin\frac{\pi}{2}$

$l = \lim_{n\to\infty} \left(\dfrac{\sin\left(\frac{\pi}{n+1}\right)}{\frac{\pi}{(n+1)}} \times \pi\right) - 2\times 1$

$l = \dfrac{1}{\frac{1}{\pi}} - 2$

$l = \pi - 2$

$\{l\} = \{\pi - 2\}$

$= \{\pi\}$

$= \{3.14\}$

$= .14$

Nishant Jindal

Q $\lim\limits_{x\to 0} \dfrac{\sin(\pi\cos^2 x)}{x^2}$ $\xrightarrow{}$ $\sin(\pi-\theta)$ को तरफ ले जाओ

$\boxed{\text{mans 5 times}}$

$\cancel{\longrightarrow} \lim\limits_{x\to 0} \dfrac{\sin(\pi\cos^2 x)}{\pi\cos^2 x} \times \dfrac{\pi\cos^2 x}{x^2}$ $\longrightarrow$ $\dfrac{\sin\pi}{\pi}$ not $\dfrac{\sin 0}{0}$

1

$$\lim_{x\to 0} \frac{\sin(\pi(1-\sin^2 x))}{x^2}$$

$\sin(\pi-\theta)=\sin\theta$

$$\lim_{x\to 0} \frac{\sin(\pi-\pi\sin^2 x)}{x^2}$$

$\dfrac{\sin 0}{0}$

$$\lim_{x\to 0} \frac{\sin(\pi\sin^2 x)}{(\pi\sin^2 x)} \times \frac{\pi\sin^2 x}{x^2}$$

$$\lim_{x\to 0} 1 \times \pi \times \left(\frac{\sin x}{x}\right)^2$$

$$1\times\pi\times 1^2 = \pi$$

Q $\lim\limits_{x\to 0} \dfrac{\sin(\pi\cdot\cos^2(\tan(\sin x)))}{x^2}$

$$\lim_{x\to 0} \frac{\sin(\pi\cdot(1-\sin^2(\tan(\sin x))))}{x^2}$$

$\longrightarrow \sin \pi-\theta$

$$\lim_{x\to 0} \frac{\sin(\pi-\pi\sin^2(\tan(\sin x)))}{x^2}$$

$$\lim_{x\to 0} \frac{\sin(\pi\sin^2(\tan(\overset{x}{\boxed{\sin x}})))}{x^2}$$

Attn

$\tan(\sin x) = \sin x = x$

$$\lim_{x\to 0} \frac{\sin(\pi\sin^2 x)}{(\pi\sin^2 x)} \times \frac{\pi\sin^2 x}{x^2} = \pi$$

Nishant Jindal

$1-\cos 2x = 2\sin^2 x \qquad \sin 2x = 2\sin x\cos x$

Q (Adv) $\displaystyle\lim_{x\to 0} \frac{x\,\boxed{\tan 2x} - 2x\,\boxed{\tan x}}{(1-\cos 2x)^2}$

$$\lim_{x\to 0} \frac{x\cdot\frac{\sin 2x}{\cos 2x} - \frac{2x\sin x}{\cos x}}{4\sin^4 x}$$

$$\lim_{x\to 0} \frac{2\cancel{x}\,\cancel{\sin x}\left[\frac{\cos x}{\cos 2x} - \frac{1}{\cos x}\right]}{2\cancel{4}\cdot\cancel{\sin x}\,\cancel{\sin x}\cdot\sin^2 x}$$

$$\frac{1}{2}\lim_{x\to 0}\left[\frac{\cos^2 x - \boxed{\cos 2x}}{\boxed{\cos x}\,\boxed{\cos 2x}}\right]\frac{1}{\sin^2 x}$$

$$\frac{1}{2}\lim_{x\to 0}\frac{\cos^2 x - (2\cos^2 x - 1)}{\cos 0\,\cos 0\cdot\sin^2 x} = \frac{1}{2}\lim_{x\to 0}\frac{\cancel{1-\cos^2 x}}{\cancel{\sin^2 x}} = 1\times\frac{1}{2}$$

$$= \frac{1}{2}$$

Q2 (Adv) $\displaystyle\lim_{x\to\infty} x\left[\tan^{-1}\left(\frac{x+1}{x+2}\right) - \tan^{-1}\left(\frac{x}{x+2}\right)\right]$ $\qquad \tan^{-1}A - \tan^{-1}B = \tan^{-1}\dfrac{A-B}{1+AB}$

$$\lim_{x\to\infty} x\,\tan^{-1}\left[\frac{\frac{x+1}{x+2} - \frac{x}{x+2}}{1+\left(\frac{x+1}{x+2}\right)\left(\frac{x}{x+2}\right)}\right]$$

$$\lim_{x\to\infty} x\,\tan^{-1}\left(\frac{\frac{1}{\cancel{x+2}}}{\frac{2x^2+5x+4}{(x+2)^{\cancel{2}}}}\right)$$

$$\lim_{x\to\infty} \cancel{x}\cdot\frac{\tan^{-1}\left(\frac{x+2}{2x^2+5x+4}\right)}{\left(\frac{x+2}{2x^2+5x+4}\right)}\times\left(\frac{x+2}{2x^2+5x+4}\right)$$

$$\lim_{x\to\infty} x\cdot\left(\frac{x+2}{2\boxed{x^2}+5x+4}\right)$$

$$= \frac{1}{2}$$

Nishant Jindal

$$\boxed{\lim_{x\to 0}\frac{1-\cos x}{x^2}=\frac{1}{2}}$$ याद

$$\frac{1-\cos(\text{Same})}{(\text{Same})^2}$$

$$\frac{1-\cos 0}{0^2}$$

Q $\lim_{x\to 0}\frac{1-\cos x}{x^2}$ $\frac{0}{0}$ DL

$$\lim_{x\to 0}\frac{0+\sin x}{2x}=\frac{1}{2}$$

Q $\lim_{x\to 0}\frac{1-\cos(\sin x)}{x^2}$

$$\lim_{x\to 0}\cancel{\frac{1-\cos(\sin x)}{\sin^2 x}}\times\cancel{\frac{\sin^2 x}{x^2}}$$

$$\frac{1}{2}\times 1=\frac{1}{2}$$

Q $\lim_{x\to 0}\frac{1-\cos(1-\cos x)}{x^4}$

$1-\cos 0=0$

$$\lim_{x\to 0}\cancel{\frac{1-\cos(1-\cos x)}{(1-\cos x)^2}}\times\frac{(1-\cos x)^2}{x^4}$$

$$\frac{1}{2}\times\lim_{x\to 0}\left(\cancel{\frac{1-\cos x}{x^2}}\right)^2$$

$$\frac{1}{2}\times\left(\frac{1}{2}\right)^2=\frac{1}{8}$$

Q $\lim_{x\to 0}\frac{1-\cos 3x}{x^2}$

$$\lim_{x\to 0}\cancel{\frac{1-\cos(3x)}{9x^2}}\times 9$$

$$\frac{1}{2}\times 9=\frac{9}{2}$$

Q $\lim_{x\to 0}\frac{1-\cos mx}{x^2}$

$$\lim_{x\to 0}\frac{1-\cos(mx)}{m^2x^2}\times m^2=\frac{m^2}{2}$$

Q $\lim_{x\to 0}\frac{1-\cos 7x}{x^2}=\frac{7^2}{2}=\frac{49}{2}$

Nishant Jindal

Q $\lim_{x\to 0^+} \dfrac{\pi\left(1-\sqrt{1-x^2}\right)}{\sqrt{1+x^2}\,(\sin^{-1}x)^2}$

Single Party Inverse metho

take that = t

$\boxed{\begin{array}{l}\sin^{-1}x = t \leftarrow \text{let} \\ x=\sin t \\ x\to 0^+ \\ \sin t\to 0^+ \\ t\to 0^+\end{array}}$ } Calculation

$\sqrt{\cos^2 t} = |\cos t|$ (+)

$= \cos t$

$\lim_{t\to 0^+} \dfrac{\pi\left(1-\sqrt{1-\sin^2 t}\right)}{\sqrt{1+\sin^2 t}\,(t)^2}$

$1=\sqrt{1+\sin^2 0}$

$\dfrac{1}{1}\lim_{t\to 0^+}\dfrac{\pi\left(1-\cos t\right)}{t^2} = \dfrac{\pi}{2}$

$ax^2+bx+c=0$ has Root α & β.

$ax^2+bx+c = a(x-\alpha)(x-\beta)$ Algebra से पढ़ा है

$\lim_{x\to\alpha} \dfrac{1-\cos(a(x-\alpha)(x-\beta))}{a^2(x-\alpha)^2(x-\beta)^2} \times a^2(x-\beta)^2$

$\dfrac{1}{2}\times a^2(\alpha-\beta)^2$ Ans

Q If $ax^2+bx+c=0$ has 2 Root α & β then.

find $\lim_{x\to\alpha} \dfrac{1-\cos(ax^2+bx+c)}{(x-\alpha)^2}$

Q $\lim_{x\to 0} \dfrac{(\tan x-\sin x)}{x^3}$

$\lim_{x\to 0} \dfrac{(\sin x)}{x}\dfrac{\left(\dfrac{1}{\cos x}-1\right)}{x^2} = 1\times\lim_{x\to 0}\dfrac{1-\cos x}{\cos x\times x^2}$

$= 1\times\dfrac{1}{1}\times\dfrac{1}{2} = \dfrac{1}{2}$

Nishant Jindal

Q $\lim_{x \to \boxed{\frac{\pi}{2}}} \frac{\cot x - \cos x}{(\pi - 2x)^3}$

$x = \text{Constant}$

$x = \text{Constant} - h$

$\boxed{x = \frac{\pi}{2} - h}$.

$\lim_{h \to 0} \frac{\cot\left(\frac{\pi}{2} - h\right) - \cos\left(\frac{\pi}{2} - h\right)}{\left(\cancel{\pi} - (\cancel{\pi} - 2h)\right)^3}$

$\frac{1}{8} \lim_{h \to 0} \frac{\tan h - \sin h}{h^3}$

$= \frac{1}{8} \times \frac{1}{2} = \frac{1}{16}$

Q $\lim_{x \to \frac{\pi}{2}} \boxed{\frac{(1 - \tan\frac{x}{2})}{(1 + \tan\frac{x}{2})}} \cdot \frac{(1 - \sin x)}{(\pi - 2x)^3}$

Adv

$\boxed{x = \frac{\pi}{2} - h}$

$\lim_{x \to \frac{\pi}{2}} \frac{\tan\left(\frac{\pi}{4} - \frac{x}{2}\right) \cdot (1 - \sin x)}{(\pi - 2x)^3}$

$\lim_{h \to 0} \frac{\tan\left(\cancel{\frac{\pi}{4}} - \cancel{\frac{\pi}{4}} + \frac{h}{2}\right)\left(1 - \sin\left(\frac{\pi}{2} - h\right)\right)}{(\cancel{\pi} - \cancel{\pi} + 2h)^3}$

$\frac{1}{8} \lim_{h \to 0} \frac{\tan\left(\frac{h}{2}\right)}{\frac{h}{2} \times 2} \frac{(1 - \cos h)}{h^2} = \frac{1}{8} \times 1 \times \frac{1}{2} \times \frac{1}{2}$

$= \frac{1}{32}$

Q $\lim_{x \to 0} \frac{1 - \cos x \sqrt{\cos 2x}}{\tan^2 x}$ $\boxed{\text{Rat.}}$

$\lim_{x \to 0} \frac{1 - \cos^2 x \cdot (\cos 2x)}{x^2 \left(1 + \cos x \sqrt{\cos 2x}\right)}$ → limit put

$\frac{1}{2} \lim_{x \to 0} \frac{1 - \cos^2 x \cdot (1 - 2\sin^2 x)}{x^2}$

$\frac{1}{2} \lim_{x \to 0} \left(\frac{1 - \cos^2 x}{x^2} + \frac{2\sin^2 x \cos^2 x}{x^2} \right)$

$\frac{1}{2} \left(\frac{1}{2} + 2 \times 1 \times \cos^2 0 \right)$

$= \frac{5}{4}$

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Q $\lim_{x \to 0} \dfrac{1 - \cos x \cdot \cos 2x \cdot \cos 3x}{\sin^2(2x)}$

$\lim_{x \to 0} \dfrac{1 - (\cos x \cdot \cos 2x \cdot \cos 3x)}{4x^2}$

$\dfrac{1 - \frac{1}{4}(1 + \cos 2x + \cos 4x + \cos 6x)}{4x^2} = \dfrac{7}{4}$

$2\cos A \cdot \cos B = \cos(A+B) + \cos(A-B)$

$\frac{1}{2}(2\cos x \cdot \cos 2x \cdot \cos 3x)$

$\frac{1}{2}((\cos(3x) + \cos(-x)) \cdot \cos 3x)$

$\frac{1}{2 \times 2}(2\cos^2(3x) + 2\cos x \cdot \cos 3x)$

$\frac{1}{4}(1 + \cos 6x + \cos(4x) + \cos(+2x))$

Nishant Jindal

16) $\lim_{\boxed{x \to -1}} \frac{\cos 2 - \cos 2x}{x^2 - |x|}$

$|x| = -x$

$\lim_{x \to -1} \frac{\cos 2 - \cos 2x}{x^2 + x} = \frac{0}{0}$

$\frac{0 + 2\sin 2x}{(2x+1)}$

$\frac{2\sin(-2)}{-2+1}$

$\frac{+2\sin 2}{+1} = 2\sin 2$

$[\text{gr. than } \cancel{\text{less than}} -5] + [\text{less than } 6]$

$-5 + 5 = 0$

$\frac{\sin x}{x} < 1$

$\frac{-5\sin x}{x} > -5$

$-6 \quad -5$

$\left[\frac{\sin x}{x}\right] + \left[2\times 2\frac{\sin 2x}{2x}\right] + \left[3\times 3\frac{\sin 3x}{3x}\right]$

$[<1] + \left[4\left(\frac{\sin 2x}{2x}\right)\right]$

$[<1] + [<4] + [<9] + [<16] + [<25] + \cdots [<100$

$0 + 3 + 8 + 15 + \cdots$

Q19 $f(5+h) = \lim_{h \to 0} \frac{\sin\{\cancel{5}+h\}}{(5+h)^2 + a(5+h) + b} = \lim_{h \to 0} \frac{\sin h}{(5+h)^2 + a(5+h) + b}$ h

$\Rightarrow \lim_{h \to 0} \frac{h}{h(h(\frac{5}{h}+1)^2 + 5a + b}$

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$$f(5+h) = \lim_{h \to 0} \frac{\sin\{5+h\}}{(5+h)^2 + a(5+h) + b} = \lim_{h \to 0} \frac{\sin h}{(5+h)^2 + a(5+h) + b} \to \frac{0}{25 + 5a + b} = \frac{0}{0}$$

$f(3+h) \to Dr = 0 \longrightarrow \underline{5a + b + 25 = 0}$