Nishant Jindal

LIMIT

$$\lim_{n\to\infty}$$

Always try to take max term. Common & cancell them. (giving ∞)

$$\lim_{n\to\infty} \frac{\lfloor\underline{n+2} + \lfloor\underline{n+1}}{\lfloor\underline{n+2} - \lfloor\underline{n+1}}$$

$$\lim_{n\to\infty} \frac{\cancel{\lfloor\underline{n+2}}\left\{1 + \dfrac{\cancel{\lfloor\underline{n+1}}}{\cancel{\lfloor\underline{n+2}}_{(n+2)}}\right\}}{\cancel{\lfloor\underline{n+2}}\left\{1 - \dfrac{\cancel{\lfloor\underline{n+1}}}{\cancel{\lfloor\underline{n+2}}_{(n+2)}}\right\}}$$

$$\lim_{n\to\infty} \frac{1 + \cancel{\frac{1}{n+2}}}{1 - \cancel{\frac{1}{n+2}}} = \frac{1+0}{1-0} = 1$$

Q $$\lim_{n\to\infty} \frac{\lfloor\underline{3(n+1)}}{(n+1)^3 \lfloor\underline{3n}}$$ $\lfloor\underline{3n+3}$

$$\lim_{n\to\infty} \frac{(3n+3)(3n+2)(3n+1)\cancel{\lfloor\underline{3n}}}{(n+1)^3 \cancel{\lfloor\underline{3n}}}$$

$$\lim_{n\to\infty} \frac{\cancel{n^3}\left(3+\cancel{\frac{3}{n}}\right)\left(3+\cancel{\frac{2}{n}}\right)\left(3+\cancel{\frac{1}{n}}\right)}{\cancel{n^3}\left(1+\cancel{\frac{1}{n}}\right)^3}$$

$$\frac{(3+0)(3+0)(3+0)}{1^3} = 27$$

Nishant Jindal

LIMIT

Q $\lim_{x\to\infty} \frac{2x^1+7}{3x^1+4}$

$\lim_{x\to\infty} \frac{\cancel{x}\left(2+\cancel{\frac{7}{x}}\right)}{\cancel{x}\left(3+\cancel{\frac{4}{x}}\right)} = \frac{2}{3}$

Q $\lim_{x\to\infty} \frac{2x^2-3x+5}{4x^2+7x+10}$ $\frac{E}{E}$

$\lim_{x\to\infty} \frac{\cancel{x^2}\left(2-\cancel{\frac{3}{x}}+\cancel{\frac{5}{x^2}}\right)}{\cancel{x^2}\left(4+\cancel{\frac{7}{x}}+\cancel{\frac{10}{x^2}}\right)}$

$\frac{2}{4} = \frac{1}{2}$

Q $\lim_{x\to\infty} \frac{3x+5}{4x^2+7x+10}$ $\frac{\text{Smaller}}{\text{Bigger}}$

$\lim_{x\to\infty} \frac{\cancel{x}\left(3+\cancel{\frac{5}{x}}\right)}{x^{\cancel{2}}\left(4+\cancel{\frac{7}{x}}+\cancel{\frac{10}{x^2}}\right)} = \frac{3}{\infty} \to 0$

Q $\lim_{x\to\infty} \frac{2x^2-3x+5}{7x+10}$ $\frac{B}{S}$

$\lim_{x\to\infty} \frac{x^2\left(2-\frac{3}{x}+\frac{5}{x^2}\right)}{x\left(7+\frac{10}{x}\right)}$

$\to \infty$

$\lim_{x\to\infty} \frac{\text{Poly type}}{\text{Poly type}}$

(1) $\boxed{\frac{E}{E} = \frac{\text{Coeff}}{\text{Coeff}}}$

$\boxed{② \ \frac{\text{Smaller}}{\text{Bigger}} \to 0}$

$\boxed{③ \ \frac{\text{Bigger}}{\text{smaller}} \to \infty}$

Q $\lim_{x\to\infty} \frac{\sqrt{x} \to \frac{1}{2}}{\sqrt{x+\sqrt{x+\sqrt{x}}}+\sqrt{x} \to \frac{1}{2}}$ $\frac{E}{E}$

$\frac{1}{2} \quad \frac{1}{4} \quad \frac{1}{8}$

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

Q $\lim_{x\to\infty} \frac{\sqrt{2x^2-7}-\sqrt{3x^2+5}}{x^{\to 1}}$ $\frac{E}{E}$

$\frac{\sqrt{2}-\sqrt{3}}{1} = \sqrt{2}-\sqrt{3}$

Rationalise

Nishant Jindal

LIMIT

Q $\lim_{x\to\infty} \dfrac{(2x-7)(3x+1)}{(4x+2)(7x-9)} = ?$

$\boxed{2}$ $\boxed{2}$

$\dfrac{2\times 3}{4\times 7} = \dfrac{3}{14}$

Q $\lim_{x\to\infty} \left(\dfrac{x^2-3x+1}{5x^2+7}\right)^{2x+2} \to \dfrac{E}{E}$

$= \left(\dfrac{1}{5}\right)^{\infty} = (1 से कम)^{\infty}$

$= 0$

Q $\lim_{x\to\infty} \left(\dfrac{2x^2+13}{5x^2+x}\right)^{\frac{2-3x}{4x+1}} \to \dfrac{E}{E}$

$\left(\dfrac{2}{5}\right)^{-\frac{3}{4}} = \left(\dfrac{5}{2}\right)^{3/4}$

Q $\lim_{x\to\infty} \dfrac{8x^3+7x^2+\sqrt{6x^5+2}}{\sqrt{7x^6+2x^3}+2x-1}$ $\dfrac{E}{E}$

$\boxed{3}$ 2 2.5

$\boxed{3}$ 1.5 1

$= \dfrac{8}{\sqrt{7}}$

Nishant Jindal

LIMIT

Q $\lim_{x\to\infty} \dfrac{2\sqrt{x}+3x^{1/3}+4x^{1/4}+\quad +nx^{1/n}}{(2x-3)^{1/2}+(2x-3)^{1/3}+--+(2x-3)^{1/n}}$

$\boxed{1/2}$ $\boxed{1/2}$

$\dfrac{2}{\sqrt{2}} = \sqrt{2}$

Q $\lim_{x\to\infty} \dfrac{\sqrt{x^2+1}+\sqrt[3]{x^2+1}}{\sqrt[5]{2x^5+3}-\sqrt[5]{9x^4+27}} = \dfrac{1}{(2)^{1/5}}$

$\boxed{1}$ $\frac{2}{3}$ $\boxed{1}$ $4/5$

Q $\lim_{n\to\infty} \dfrac{\frac{1}{2}+1+\frac{3}{2}+\frac{4}{2}+--+\frac{n}{2}}{25n^2-7n+100}$

$\lim_{n\to\infty} \dfrac{\frac{1}{2}+\frac{2}{2}+\frac{3}{2}+\frac{4}{2}+-\;-+\frac{n}{2}}{25n^2-7n+100}$

$\frac{1}{2}\lim_{n\to\infty} \dfrac{1+2+3+--+n}{25n^2-7n+100}$

$\frac{1}{2}\lim_{n\to\infty} \dfrac{(n)(n+1)}{2(25\boxed{n^2}-7n+100)}$ $\boxed{2}$

2

$\frac{1}{2}\times\frac{1}{50}=\frac{1}{100}$

Nishant Jindal

LIMIT

Q $\lim_{n\to\infty} \frac{1+2+3+\dots+n^1}{n^2}$ diff = 1 = ?

$\lim_{n\to\infty} \frac{(n)(n+1)}{2\cdot n^2}$

$= \frac{1}{2}$

Q $\lim_{n\to\infty} \frac{1^3+2^3+\dots+n^3}{n^5}$

$\frac{(n)^2(n+1)^2 \to 4}{4n^5 \to 5} = \frac{\text{Smaller}}{\text{Bigger}}$

$= 0$

Q $\lim_{n\to\infty} \frac{1^2+2^2+3^2+\dots+n^2}{n^3}$ diff = 1 = $\frac{1}{3}$ $\boxed{3}$

$\lim_{n\to\infty} \frac{(n)(n+1)(2n+1)}{6n^{3}}$ $\boxed{3}$

$\frac{1\times1\times2}{6} = \frac{1}{3}$

Ans = $\frac{1}{\text{deg}}$

Q $\lim_{n\to\infty} \frac{1^3+2^3+3^3+\dots+n^3}{n^4}$ diff = 1

$= \frac{1}{4}$

Q $\lim_{n\to\infty} \frac{1^p+2^p+3^p+\dots+n^p}{n^{p+1}}$ diff = 1 (Definite)

$= \frac{1}{(p+1)}$

Q $\lim_{n\to\infty} \frac{1^3+2^3+\dots n^3}{n^5}$ diff ≠ 1 $= 0$

Nishant Jindal

LIMIT

Q $\lim_{n\to\infty} \dfrac{(1^4+2^4+\dots+n^4)-(1^3+2^3+\dots+n^3)}{n^5}$

$\lim_{n\to\infty} \dfrac{1^4+2^4+\dots+n^4}{n^5}$ diff = 1 $- \lim_{n\to\infty} \dfrac{1^3+2^3+\dots+n^3}{n^5}$ diff > 1

$\dfrac{1}{5} - 0 = \dfrac{1}{5}$

Q $\lim_{n\to\infty} \boxed{\dfrac{1}{2\cdot5}} + \dfrac{1}{3\cdot6} + \dfrac{1}{4\cdot7} + \dots + \dfrac{1}{(n)(n+3)}$ $= \dfrac{1}{\text{diff} \times 1^{st}\text{ term}}$

$\dfrac{1}{2\cdot5} = \dfrac{1}{\text{diff}}\left[\dfrac{1}{\text{Chhotu}} - \dfrac{1}{\text{Bda}}\right]$

diff = 3

$\dfrac{1}{2\cdot5} = \dfrac{1}{3}\left[\dfrac{1}{2} - \dfrac{1}{5}\right]$

$\dfrac{1}{1\cdot2\cdot3} = \dfrac{1}{2}\left[\dfrac{1}{1^{st}\text{ couple}} - \dfrac{1}{2^{nd}\text{ couple}}\right]$

diff = 2

$= \dfrac{1}{2}\left[\dfrac{1}{1\cdot2} - \dfrac{1}{2\cdot3}\right]$

Q $\lim_{n\to\infty} \dfrac{1}{1\cdot2\cdot3} + \dfrac{1}{2\cdot3\cdot4} + \dfrac{1}{3\cdot4\cdot5} + \dfrac{1}{4\cdot5\cdot6} + \dots + \dfrac{1}{(n)(n+1)(n+2)}$

$\dfrac{1}{\text{diff} \times 1^{st}\text{ Cou}}$

$\dfrac{1}{2}\left[\dfrac{1}{1\cdot2} - \cancel{\dfrac{1}{2\cdot3}}\right] + \dfrac{1}{2}\left[\cancel{\dfrac{1}{2\cdot3}} - \cancel{\dfrac{1}{3\cdot4}}\right] + \dfrac{1}{2}\left[\cancel{\dfrac{1}{3\cdot4}} - \cancel{\dfrac{1}{4\cdot5}}\right] + \dots + \dfrac{1}{2}\left[\cancel{\dfrac{1}{(n)(n+1)}} - \dfrac{1}{(n+1)(n+2)}\right]$

$\lim_{n\to\infty} \dfrac{1}{2}\left[\dfrac{1}{1\cdot2} - \cancel{\dfrac{1}{(n+1)(n+2)}}\right] = \dfrac{1}{(1\cdot2)\times2}$

$= \dfrac{1}{4}$

Nishant Jindal

LIMIT

Q $\lim_{n\to\infty} \frac{1}{1\cdot2\cdot3\cdot4} + \frac{1}{2\cdot3\cdot4\cdot5} + \cdots$

$\frac{1}{3\times[1\cdot2\cdot3]} =$

Q $\lim_{n\to\infty} \frac{\boxed{-3n}+(-1)^n}{\boxed{4n}-(-1)^n}$

$$\lim_{n\to\infty} \frac{\cancel{n}\left[-3+\cancel{\frac{(-1)^n}{n}}\right]}{\cancel{n}\left[4-\cancel{\frac{(-1)^n}{n}}\right]} = -\frac{3}{4}$$

Q $\lim_{n\to\infty}\left(3^n+\boxed{4^n}\right)^{\frac{1}{n}} \to \left(3^\infty+4^\infty\right)^{\frac{1}{\infty}} = (\infty)^0$

com.

$4\left(\frac{3^n}{4^n}+1\right)^{1/n}$

$\lim_{n\to\infty} 4\left(\left(\frac{3}{4}\right)^n+1\right)^{\frac{1}{n}}$

$4(0+1)^0$

$\boxed{4}$

Bigger is the Answer

Q $\lim_{n\to\infty}\left(3^n-4^n+5^n-\underline{6^n}\right)^{\frac{1}{n}}$

$\lim_{n\to\infty} 6\left(\left(\frac{3}{6}\right)^n-\left(\frac{4}{6}\right)^n+\left(\frac{5}{6}\right)^n-1\right)^{\frac{1}{n}}$

$6(0-0+0-1)^0$

$6\times1=6$

LIMIT

Q $\lim_{x\to 0}\left[(1)^{\frac{1}{\sin^2 x}}+(2)^{\frac{1}{\sin^2 x}}+(3)^{\frac{1}{\sin^2 x}}+\quad +(n)^{\frac{1}{\sin^2 x}}\right]^{\sin^2 x}$

$x\to 0$

$\sin x\to 0$

$\sin^2 x\to 0$

$\frac{1}{\sin^2 x}\to\infty$

$(1^{\infty}+2^{\infty}+3^{\infty}-\,-\,-n^{\infty})^{0}$

$= n$

$(1^n+2^n)^{\frac{1}{n}}=2 \quad (2^n+3^n)^{\frac{1}{n}}=3$

Q $\lim_{\substack{\boxed{n\to\infty}\\ m\to\infty}}\frac{1+\sqrt[n]{1^n+2^n}+\sqrt[n]{2^n+3^n}+\sqrt[n]{3^n+4^n}+\cdot\cdot\quad+\sqrt[n]{(m-1)^n+m^n}}{m^2}$

$\lim_{m\to\infty}\frac{1+2+3+4+\quad\cdot\cdot+m}{m^2}=\frac{1}{2}$

$m^2\leftarrow$ avoid

Nishant Jindal

LIMIT

$\frac{0}{\infty} = 0$

Q $\lim_{x\to\infty}\left(\frac{x^2+1}{x+1} - ax - b\right) = 0$ find a, b?

$\lim_{x\to\infty}\left(\frac{x^2+1-ax(x+1)-b(x+1)}{x+1}\right) = 0$

$\lim_{x\to\infty}\left(\frac{x^2+1-ax^2-ax-bx-b}{x+1}\right) = 0$

$\lim_{x\to\infty} \boxed{\frac{x^2(1-a)}{x+1}} + \boxed{\frac{x^1(-a-b)}{x+1}} + \frac{(1-b)}{x+1} = 0$

B/S | E/E

$1-a=0$ | $-a-b=0$ | $(a,b) \equiv (1,-1)$

$a=1$ | $b=-a$

$b=-1$

Q $\lim_{x\to\infty} \frac{ax^2+bx+c}{x} = 0$ then a, b, c?

$\lim_{x\to\infty} \boxed{\frac{ax^2}{x}} + \frac{b\cancel{x}}{\cancel{x}} + \frac{c}{x} = 0$

B/E

$a=0$ | $b=0$ | $c \in R$

Q $\lim_{x\to 0} \frac{ax^2+bx+c}{x} = 0$ then a, b, c?

$\lim_{x\to 0} \frac{ax^{\cancel{2}}}{\cancel{x}} + \boxed{\frac{bx}{x}} + \boxed{\frac{c}{x}} = 0$

$\boxed{a \in R}$ | $\boxed{b=0}$ | $c=0$

Nishant Jindal

LIMIT

Q $\lim_{x\to\infty} \dfrac{a(2x^3-x^2)+b(x^3+5x^2-1)-c(3x^3+x^2)}{a(5x^4-x)-bx^4+c(4x^4+1)+2x^2+5x} = 1$ than a, b, c?

$$\lim_{x\to\infty} \frac{x^3(2a+b-3c)+x^2(-a+5b-c)+0\cdot x-b}{x^4(\underbrace{5a-b+4c}_{})+0\cdot x^3+2x^2+x(-a+5)+c} = \boxed{1} \rightarrow \text{Ans hai} \Rightarrow \boxed{\begin{matrix}0\\ \times\end{matrix}} \quad \boxed{\begin{matrix}\infty\\ \times\end{matrix}}$$

$\frac{E}{E} \Rightarrow$ game hai

$\frac{S}{B}$	$\frac{B}{S}$
$\times$	$\times$

$5a-b+4c=0$ | $2a+b-3c=0$ | $\dfrac{-a+5b-c}{2} = 1$

$$\left.\begin{aligned} 5a-b+4c&=0\\ 2a+b-3c&=0\\ -a+5b-c&=2 \end{aligned}\right\} \quad a = -\frac{2}{109} \;\Big|\; b = \frac{46}{109} \;\Big|\; c = \frac{14}{109}$$

Check urself

Nishant Jindal

LIMIT

Q. If $a_n+b_n+c_n=2n+1$; $a_nb_n+b_nc_n+c_na_n=2n-1$; $a_n\cdot b_n\cdot c_n=-1$ and $a_n<b_n<c_n$ then $\lim_{n\to\infty} n\cdot a_n=?$

[Ex]

In teeno se cubic

$$x^3-(a_n+b_n+c_n)x^2+(a_nb_n+b_nc_n+c_na_n)x-a_nb_nc_n=0$$

$$x^3-(2n+1)x^2+(2n-1)x+1=0$$

$$x^3-2nx^2-x^2+2nx-x+1=0$$

$$x^2(x-1)-2nx(x-1)-1(x-1)=0$$

$$\boxed{(x-1)}(x^2-2nx-1)=0$$

$$=n+\sqrt{n^2+1},\ 1,\ n-\sqrt{n^2+1}$$

$c_n \quad b_n \quad a_n$

$$\lim_{n\to\infty} n\cdot a_n$$

$$\lim_{n\to\infty} n\left(n-\sqrt{n^2+1}\right)$$

Rat

$$\lim_{n\to\infty}\frac{n(\cancel{n^2}-(\cancel{n^2}+1))}{n+\sqrt{n^2+1}}=\frac{n^1}{n^1+\sqrt{n^2+1}}$$

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

Dekha Dekha sa lgta.

$$\left.\begin{aligned}\alpha+\beta+\gamma&=\\ \alpha\beta+\beta\gamma+\gamma\alpha&=\\ \alpha\cdot\beta\cdot\gamma&=\end{aligned}\right\}$$ Kha Dekha

Cubic eqn

$$x^3-(\alpha+\beta+\gamma)x^2+(\alpha\beta+\beta\gamma+\gamma\alpha)x-\alpha\beta\gamma=0$$

$$x=\frac{2n\pm\sqrt{4n^2-4}}{2}=n\pm\sqrt{n^2-1}$$

Nishant Jindal

LIMIT

Q $\lim\limits_{\boxed{x\to\infty}} \dfrac{\log x^n - [x]}{[x]}$

$\lim\limits_{x\to\infty} [x] = x$

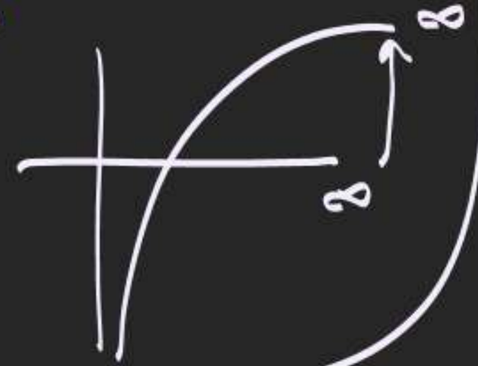
$\lim\limits_{x\to\infty} \dfrac{n\log x - x}{x}$

$\log\infty = \log$ at ∞

$n \lim\limits_{x\to\infty} \dfrac{(\log x)\to\infty}{x\to\infty} - 1$ $\boxed{DL}$

$n \lim\limits_{x\to\infty} \dfrac{\frac{1}{x}}{1} - 1$

$n\times 0 - 1 = -1$



Q 1-15 $\underline{Ex1}$

27

Ex2 1, 2, 5, 6, 7, 10

13, 14

LIMIT

DPP 2

Q8

$$f(x) = |\sin^{-1}x| + \cos^{-1}\left(\frac{1}{x}\right) = \sec^{-1}x$$

$-1 \le x \le 1$

$x \in (-\infty, -1] \cup [1, \infty)$

$\operatorname{sgn}\left(\frac{\pi}{2}\right) = 1$

$\operatorname{sgn}\left(\frac{3\pi}{2}\right) = 1$ $\boxed{D}$ ✓

$x \in \{-1, 1\}$

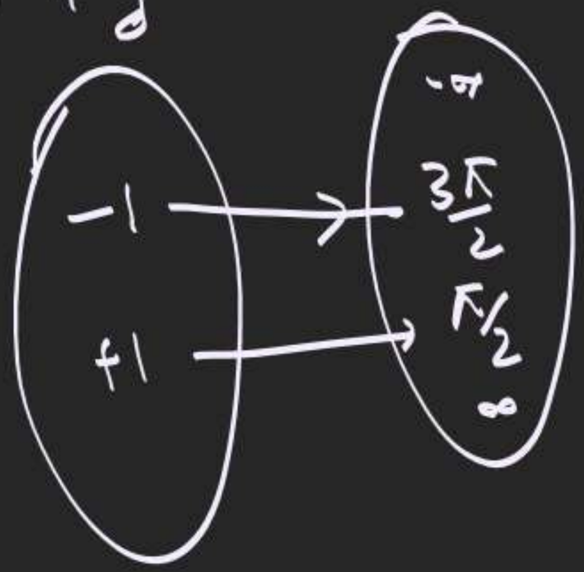
$f(-1) = |\sin^{-1}(-1)| + \cos^{-1}\frac{1}{-1}$

$= \left|-\frac{\pi}{2}\right| + \pi = \frac{3\pi}{2}$

$f(1) = |\sin^{-1}1| + \cos^{-1}\frac{1}{1}$

$= \left|\frac{\pi}{2}\right| + 0 = \frac{\pi}{2}$

Inj → 1-2-1 (A) ✓



1-2-1

Many 1 (x) (B) X

2 Ans → $\boxed{C}$ X

LIMIT

$$\frac{x+1}{x+1} = 1$$

(C) $\tan^{-1}\left(\frac{x}{1+|x|}\right)$

(P) $f(x) = \sin^{-1}\left(\frac{x}{1+|x|}\right)$

$$\lim_{x\to\infty} \frac{|x|}{|x|+1} = 1 \qquad \frac{x}{1+|x|} \in (-1,1)$$

$$\frac{0}{0+1} = 0 \qquad \tan^{-1} \in \left(-\frac{\pi}{4}, \frac{\pi}{4}\right)$$

$$y = \frac{x}{1+|x|} \rightarrow \begin{cases} \frac{x}{1+x} < 1 & x > 0 \\ \frac{x}{1-x} & x < 0 \end{cases}$$

$$\lim_{x\to-\infty} \frac{x}{-x+1} \equiv \frac{0}{-0+1} = 0$$

$$= -1$$

A → S. B → P, C → R

(Q) $\cos^{-1}\left(\frac{x}{1+|x|}\right)$

$$\frac{x}{1+|x|} \in (-1,1)$$

$$\frac{x}{1+|x|} \in (-1,1)$$

$$\sin^{-1}\left(\frac{x}{1+|x|}\right) \in \left(\sin^{-1}(-1), \sin^{-1}(1)\right)$$

$$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$$

$$\cos^{-1}\left(\frac{x}{1+|x|}\right) \in \left(\cos^{-1}(1), \cos^{-1}(-1)\right)$$

$$(0, \pi)$$