Nishant Jindal

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

$x = \sin\theta$

$x \to \frac{1}{\sqrt{2}}$

$\sin\theta \to \frac{1}{\sqrt{2}}$

$\theta \to \frac{\pi}{4}$

$\lim_{\theta \to \frac{\pi}{4}} \dfrac{\cos^{-1}\left(2\sin\theta\cos\theta\right)}{\sin\theta - \frac{1}{\sqrt{2}}}$

$\lim_{\theta \to \frac{\pi}{4}} \dfrac{\cos^{-1}\left(\sin 2\theta\right)}{\sin\theta - \frac{1}{\sqrt{2}}}$

$\lim_{\theta \to \frac{\pi}{4}} \dfrac{\frac{\pi}{2} - \sin^{-1}(\sin 2\theta)}{\sin\theta - \frac{1}{\sqrt{2}}} = \lim_{\theta \to \frac{\pi}{4}} \dfrac{\frac{\pi}{2} - 2\theta}{\sin\theta - \frac{1}{\sqrt{2}}}$ $\frac{0}{0}$ DL

$= \lim_{\theta \to \frac{\pi}{4}} \dfrac{0 - 2}{\cos\theta - 0} = \dfrac{-2}{\frac{1}{\sqrt{2}}} = -2\sqrt{2}$

$\frac{1}{x} \to 0 \Rightarrow \sin\frac{1}{x} \to \frac{1}{x}$

Q $\lim_{\boxed{x \to -\infty}} \dfrac{(3x^4 + 2x^2)\sin\frac{1}{x} + |x|^3 - 5}{|x|^3 + |x|^2 + |x| + 1}$

① $\boxed{|x| = -x}$

② $\sin\frac{1}{x} \to \frac{1}{x}$ $\lim_{x \to -\infty} \dfrac{(3x^{\cancel{4}\,3} + 2\cancel{x^2}\,x)\cdot\cancel{\frac{1}{x}} - x^3 - 5}{-x^3 + x^2 - x + 1} = \frac{E}{E}$

$\dfrac{3-1}{-1} = -2$

Nishant Jindal

# Standard Limit (2)

1) $\lim_{x\to 0} \frac{a^x-1}{x} = \ln a$

$\frac{a^{\text{Same}}-1}{\text{Same}} = \ln a$

$\frac{a^0-1}{0}$

2) $\lim_{x\to 0} \frac{e^x-1}{x} = 1$

$\frac{e^{\text{Same}}-1}{\text{Same}}$

$\frac{e^0-1}{0}$

3) $\lim_{x\to 0} \frac{\ln(1+x)}{x} = 1.$

$\frac{\ln(1+\text{Same})}{\text{Same}}$ $\quad$ $\frac{\ln(1+0)}{0}$

Q $\lim_{x\to 0} \frac{a^x-1}{x} = ?$ $a>0$

$\frac{1-1}{0} = \frac{0}{0}$ DL

$\lim_{x\to 0} \frac{a^x \ln a - 0}{1} = a^0 \cdot \ln a = \ln a.$

Q $\lim_{x\to 0} \frac{\ln(1+x)}{x} = \frac{\ln 1}{0} = \frac{0}{0}$ DL

$\lim_{x\to 0} \frac{\frac{1}{(1+x)}\times 1}{1} = \frac{1}{1+0} = 1$

Nishant Jindal

# Standard Limit (2)

1) $\lim_{x\to 0} \frac{a^x-1}{x} = \ln a$

$\frac{a^{\text{same}}-1}{\text{same}} = \ln a$

$\frac{a^0-1}{0}$

2) $\lim_{x\to 0} \frac{e^x-1}{x} = 1$

$\frac{e^{\text{same}}-1}{\text{same}}$

$\frac{e^0-1}{0}$

3) $\lim_{x\to 0} \frac{\ln(1+x)}{x} = 1.$

$\frac{\ln(1+\text{same})}{\text{same}}$

$\frac{\ln(1+0)}{0}$

Q $\lim_{x\to 0} \frac{e^{\sin x}-1}{x}$

$\boxed{\lim_{x\to 0} \frac{e^x-1}{x} = 1}$

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

$\lim_{x\to 0} \frac{a^x-1}{x} = \ln a$

$1 \times 1 = 1$

Q $\lim_{x\to 0} \frac{\ln(1+3x)}{x} = ?$

$\lim_{x\to 0} \frac{\ln(1+x)}{x} = 1$

$\lim_{x\to 0} \left(\frac{\ln(1+3x)}{3x}\right) \times 3 = 1 \times 3 = 3.$

Q $\lim_{x\to 0} \frac{2^x-1}{x} = \ln 2$

Nishant Jindal

# Standard Limit (2)

1) $\lim_{x \to 0} \frac{a^x - 1}{x} = \ln a$

$\frac{a^{\text{Same}} - 1}{\text{Same}} = \ln a$

$\frac{a^0 - 1}{0}$

2) $\lim_{x \to 0} \frac{e^x - 1}{x} = 1$

$\frac{e^{\text{Same}} - 1}{\text{Same}}$

$\frac{e^0 - 1}{0}$

3) $\lim_{x \to 0} \frac{\ln(1+x)}{x} = 1$

$\frac{\ln(1+\text{Same})}{\text{Same}}$

$\frac{\ln(1+0)}{0}$

Q $\lim_{x \to 0} \frac{\ln(1+x+x^2)}{x(x+1)} = ?$

$\lim_{x \to 0} \frac{\ln(1+(x+x^2))}{(x+x^2)} = 1$

Nishant Jindal

Q 30 $\lim_{x\to 0} \frac{e^x + e^{-x} - 2}{x^2}$

$\lim_{x\to 0} \frac{(e^{x/2} - e^{-x/2})^2}{x^2}$

$\lim_{x\to 0} \left(\frac{e^x - 1}{e^{x/2} x}\right)^2$

$\boxed{(e^x - e^{-x})^2 = e^{2x} + e^{-2x} - 2}$

$\frac{1^2}{e^{0/2}} = \frac{1^2}{1} = 1$



**21.** Evaluate: $\lim_{x\to 0}\left(\frac{1-\cos x\cos 2x\cos 3x}{\sin^2 2x}\right)$

**22.** Evaluate: $\lim_{x\to 0}\left(\frac{\sin^{-1} x-\tan^{-1} x}{x^3}\right)$

**23.** Evaluate: $\lim_{x\to 0}\left(\frac{x-\sin x}{x^3}\right)$

**24.** Evaluate: $\lim_{x\to 0}\left(\frac{x-\tan x}{x^3}\right)$

**25.** Evaluate: $\lim_{x\to \infty}\left(\frac{x+\sin x}{x+\cos x}\right)$

**26.** Evaluate: $\lim_{x\to 0}\left(\left[\frac{n\sin x}{x}\right]+\left[\frac{n\tan x}{x}\right]\right)$

**27.** If $= \min\{x^2 + 2x + 3, x^2 + 4x + 10\}$

and $b = \lim_{x\to 0}\left(\frac{1-\cos\theta}{\theta^2}\right)$, then find the value of $\sum_{r=0}^{n}(a^r b^{n-r})$

**Exponential Limit**

**28.** Evaluate: $\lim_{x\to 0}\left(\frac{e^{4x}-1}{5x}\right)$

**29.** Evaluate: $\lim_{x\to 0}\left(\frac{e^{3x}-1}{e^{5x}-1}\right)$

**30.** Evaluate: $\lim_{x\to 0}\left(\frac{e^x+e^{-x}-2}{x^2}\right)$ $\frac{1+1-2}{0} = \frac{0}{0} \Rightarrow \frac{e^x - e^{-x}}{2x}\left(\frac{0}{0}\right) \to \frac{e^x + e^{-x}}{2}$

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



Q $\lim_{x\to 0} \frac{e^{4x}-1}{5x}$

$\lim_{x\to 0} \frac{e^{4x}-1}{4x} \times \frac{4}{5}$

$1 \times \frac{4}{5} = \frac{4}{5}$

Q29 $\lim_{x\to 0} \frac{e^{3x}-1}{e^{5x}-1}$

$\lim_{x\to 0} \frac{e^{3x}-1}{3x} \times \frac{5x}{e^{5x}-1} \times \frac{3}{5}$

$1 \times 1 \times \frac{3}{5} = \frac{3}{5}$

Nishant Jindal

Q32 $\lim_{x\to 0} \frac{e^x - e^{\sin x}}{x - \sin x}$

Walla Cm

Pichhe $a^{x_1} a^{x_2}$

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

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

$$e^{\sin 0} \times 1 = 1 \times 1$$
$$= 1$$



31. Evaluate: $\lim_{x\to 0} \frac{e^{3+x} - \sin x - e^3}{x}$

32. Evaluate: $\lim_{x\to 0} \frac{e^x - e^{\sin x}}{x - \sin x}$

33. Evaluate: $\lim_{x\to 0} \left(\frac{e^x - e^{x\cos x}}{x + \sin x}\right)$

34. Evaluate: $\lim_{x\to 0} \left(\frac{e^x - 1 - x}{x^2}\right)$

35. Evaluate: $\lim_{x\to 0} \left(\frac{8^x - 4^x - 2^x + 1}{x^2}\right)$

36. Evaluate: $\lim_{x\to 0} \frac{9^x - 2.6^x + 4^x}{x^2}$

37. Evaluate: $\lim_{x\to a} \left(\frac{a^x - a^a}{x - a}\right), a > 0$

38. Evaluate: $\lim_{x\to 0} \left(\frac{a^{x+h} + a^{x-h} - 2a^x}{h^2}\right)$

39. Evaluate: $\lim_{x\to 0} \left(\frac{8^x - 7^x}{6^x - 5^x}\right)$

40. Evaluate: $\lim_{x\to 0} \left(\frac{(5^x - 1)(4^x - 1)}{(3^x - 1)(6^x - 1)}\right)$



Q $\lim_{x\to 0} \frac{e^{3+x} - \sin x - e^3}{x}$

$$\lim_{x\to 0} \frac{(e^3 \cdot e^x - e^3) - \sin x}{x}$$

$$\lim_{x\to 0} \frac{e^3(e^x - 1)}{x} - \frac{\sin x}{x}$$

$$e^3 \times 1 - 1 = e^3 - 1$$

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$8^x = (4\cdot 2)^x = 4^x\cdot 2^x$

Q39 $\lim_{x\to 0}\frac{8^x-7^x}{6^x-5^x}$

$\lim_{x\to 0}\frac{(8^x-1)-(7^x-1)}{(6^x-1)-(5^x-1)}$

$\lim_{x\to 0}\frac{\left(\frac{8^x-1}{x}\right)-\left(\frac{7^x-1}{x}\right)}{\left(\frac{6^x-1}{x}\right)-\left(\frac{5^x-1}{x}\right)}$

$\frac{\ln 8-\ln 7}{\ln 6-\ln 5}=\frac{\ln\frac{8}{7}}{\ln\frac{6}{5}}$



31. Evaluate: $\lim_{x\to 0}\frac{e^{3+x}-\sin x-e^3}{x}$

32. Evaluate: $\lim_{x\to 0}\frac{e^x-e^{\sin x}}{x-\sin x}$

33. Evaluate: $\lim_{x\to 0}\left(\frac{e^x-e^{x\cos x}}{x+\sin x}\right)$

34. Evaluate: $\lim_{x\to 0}\left(\frac{e^x-1-x}{x^2}\right)$

35. Evaluate: $\lim_{x\to 0}\left(\frac{8^x-4^x-2^x+1}{x^2}\right)$

36. Evaluate: $\lim_{x\to 0}\frac{9^x-2.6^x+4^x}{x^2}$

37. Evaluate: $\lim_{x\to a}\left(\frac{a^x-a^a}{x-a}\right), a > 0$

38. Evaluate: $\lim_{x\to 0}\left(\frac{a^{x+h}+a^{x-h}-2a^x}{h^2}\right)$

39. Evaluate: $\lim_{x\to 0}\left(\frac{8^x-7^x}{6^x-5^x}\right)$

40. Evaluate: $\lim_{x\to 0}\left(\frac{(5^x-1)(4^x-1)}{(3^x-1)(6^x-1)}\right)$

Q $\lim_{x\to 0}\frac{\left(\frac{5^x-1}{x}\right)\left(\frac{4^x-1}{x}\right)}{\left(\frac{3^x-1}{x}\right)\left(\frac{6^x-1}{x}\right)}$

$\frac{\ln 5\times\ln 4}{\ln 3\times\ln 6}$

Q35 $\lim_{x\to 0}\frac{8^x-4^x-2^x+1}{x^2}$

$\lim_{x\to 0}\frac{(4^x\cdot 2^x-4^x)-2^x+1}{x^2}$

$\frac{4^x(2^x-1)-1(2^x-1)}{x^2}$

$\lim_{x\to 0}\left(\frac{2^x-1}{x}\right)\left(\frac{4^x-1}{x}\right)$

$\ln 2\times\ln 4$

Q $\lim_{x\to 0}\frac{e^x-e^{x\cos x}}{x+\sin x}$

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

$e^{0\cdot\cos 0}\lim_{x\to 0}\left(\frac{e^{x(1-\cos x)}-1}{x(1-\cos x)}\times\frac{x(1-\cos x)}{x+\cos x}\right)$

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

$1\times\frac{1}{2}\times\frac{1}{2}\times 0 = 0$

Q $\lim_{x\to5}\frac{\log x-\log 5}{x-5}$ $\frac{0}{0}$ DL

$$\frac{\frac{1}{x}-0}{1-0}=\frac{1}{5}$$

Q $\lim_{x\to0}\frac{\ln(\cos x)}{\sqrt[4]{1+x^2}-1}$

so

$$\lim_{x\to0}\left(\frac{\ln(1-\overset{\to 0}{(1-\cos x)})}{-(1-\cos x)}\right)\times\frac{-(1-\cos x)}{(1+x^2)^{\frac{1}{4}}-1}$$

B.T.

$$1\times\lim_{x\to0}\frac{-(1-\cos x)}{\cancel{x}+\frac{x^2}{4}-\cancel{x}}$$

$$-4\left(\frac{1-\cos x}{x^2}\right)=-4\times\frac{1}{2}=-2$$



**41.** Evaluate: $\lim_{x\to0}\left(\frac{x\cdot2^x-x}{1-\cos x}\right)$

**42.** Evaluate: $\lim_{x\to0}\left(\frac{e^x-e^{-x}-2x}{x-\sin x}\right)$

**43.** Evaluate: $\lim_{x\to0}\left(\frac{e^{x^3}-1-x^3}{\sin^6 2x}\right)$

**44.** Evaluate: $\lim_{x\to0}\left(\frac{\log(1+3x)}{\sin 2x}\right)$

**45.** Evaluate: $\lim_{x\to0}\left(\frac{\log(1+3x)}{\log(1-2x)}\right)$.

**46.** Evaluate: $\lim_{x\to e}\left(\frac{\log x-1}{x-e}\right)$

**47.** Evaluate: $\lim_{x\to5}\left(\frac{\log x-\log 5}{x-5}\right)$.

**48.** Evaluate: $\lim_{x\to5}\left(\frac{\log(x+5)-\log(5-x)}{x-5}\right)$

**49.** Evaluate: $\lim_{x\to0}\left(\frac{e^x-\log(x+e)}{e^x-1}\right)$

**50.** Evaluate: $\lim_{x\to0}\left(\frac{\ln(\cos x)}{\sqrt[4]{1+x^2}-1}\right)$.



Q44 $\lim_{x\to0}\frac{\log(1+3x)}{\sin 2x}$

$$\lim_{x\to0}\left(\frac{\log(1+3x)}{3x}\right)\times\frac{3x}{2x}$$

$$1\times\frac{3}{2}=\frac{3}{2}$$

Q45 $\lim_{x\to0}\frac{\log(1+3x)}{\log(1-2x)}=\frac{3x}{-2x}=-\frac{3}{2}$

Q $\lim_{x\to e}\frac{\log x-1}{x-e}=\frac{0}{0}$ DL.

$$\frac{\frac{1}{x}-0}{1}=\frac{1}{e}$$

Nishant Jindal

Q $\lim_{x\to 0} \dfrac{(2^{\sin x}-1)\ln(1+\sin 2x)}{x\cdot(\arctan x)}$ $\to a^x - 1$

$\lim_{x\to 0} \dfrac{1-\cos mx}{x^2} = \dfrac{m^2}{2}$

$\lim_{x\to 0} \left(\dfrac{2^{\sin x}-1}{\sin x}\right) \times \boxed{\sin x} \times \left(\dfrac{\ln(1+\sin 2x)}{\sin 2x}\right) \times \sin 2x \times \dfrac{1}{x(\tan^{-1}x)}$

$\ln 2 \times 1 \times \dfrac{\cancel{x} \times 2\cancel{x} \times 1}{\cancel{x} \times \cancel{x}} = 2\ln 2$

Q

$a = \lim_{x\to 0} \dfrac{\ln \cos 2x}{x^2}$

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

$1 \times -\left(\dfrac{2^2}{2}\right)$

$= -2$

$b = \lim_{x\to 0} \dfrac{\sin^2(2x)}{x(1-e^x)}$

$b = \lim_{x\to 0} \dfrac{(2x)^2}{x^2\left(\dfrac{1-e^x}{x}\right)} = \dfrac{4\cancel{x^2}}{\cancel{x^2}\times -1}$

$= -4$

$c = \lim_{x\to 1} \dfrac{\sqrt{x}-x}{\ln x} = \dfrac{0}{0}$

$\dfrac{\frac{1}{2\sqrt{x}} - 1}{\frac{1}{x}} = \dfrac{-1/2}{1} = -1/2$

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Q $\lim_{x\to 0} \ln(1+\sin^2 x)\cot(\ln^2(1+x)) = ?$

$$\lim_{x\to 0} \frac{\ln(1+\sin^2 x)}{\sin^2 x} \times \boxed{\sin^2 x} \times \frac{\ln^2(1+x)}{\tan(\ln^2(1+x))} \times \frac{1}{\ln^2(1+x)}$$

$$1 \times 1 \times \lim_{x\to 0}\left(\frac{x}{\ln(1+x)}\right)^2 = (1)^2 = 1$$

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

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

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

$$1 + \frac{1}{2} = \frac{3}{2}$$

Q. $\lim_{h\to 0} \frac{a^{x+h} + a^{x-h} - 2a^x}{h^2}$

$$a^x \lim_{h\to 0} \frac{(a^h + a^{-h} - 2)}{h^2}$$

$\boxed{\lim h \to 0 \quad x \text{ const}}$

$$a^x \lim_{h\to 0}\left(\frac{(a^h-1)}{h\,a^{h/2}}\right)^2 = a^x \cdot \ln^2 a \times \frac{1}{a^0}$$

$$= a^x \ln^2 a$$

$$e^x + e^{-x} - 2$$

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

$$= \left(\frac{e^x - 1}{e^{x/2}}\right)^2$$

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Q $\lim\limits_{x\to 4} \dfrac{(\cos\alpha)^x - (\sin\alpha)^x - \cos 2\alpha}{x-4} = \dfrac{0}{0}$ DL.

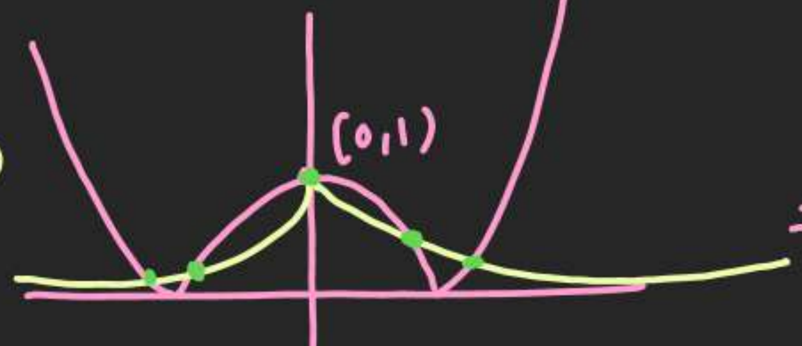
Const

$\lim\limits_{x\to 4} \dfrac{(\cos\alpha)^x \cdot \ln\cos\alpha - (\sin\alpha)^x \cdot \ln\sin\alpha - 0}{1-0}$

$(\cos\alpha)^4 \ln\cos\alpha - (\sin\alpha)^4 \ln\sin\alpha.$

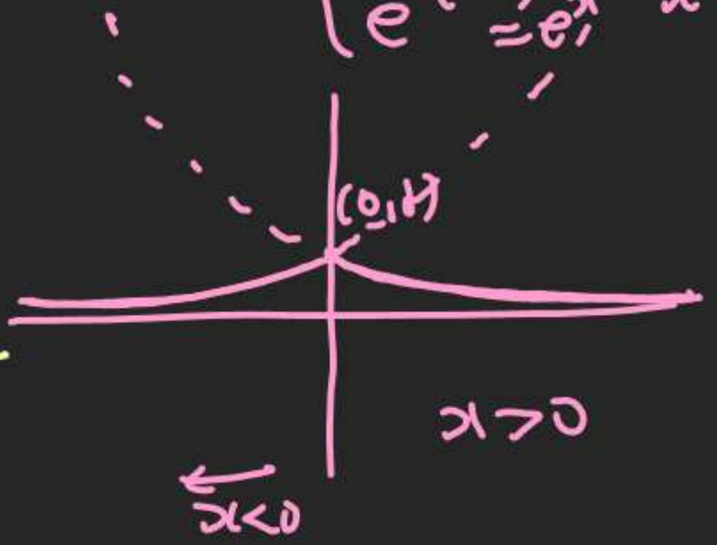
$Y = x^2 - 1$


$Y = |x^2 - 1|$




No of Roots = 5

$Y = e^{-|x|} = \begin{cases} e^{-x} & x \geq 0 \\ e^{-(-x)} = e^{x} & x < 0 \end{cases}$




Q If $f(x) = \lim\limits_{\boxed{a\to x}} \left( \dfrac{e^{a^2+|x|-x^2} - e^{|x|}}{(a+x)\sin(a-x)} \right)$; $x \in R$ then No. of Roots of eqn $\boxed{f(x)\cdot|x^2-1| = 1}$ is?

$f(x) = \lim\limits_{a-x\to 0} \dfrac{e^{|x|}\left(e^{a^2-x^2}-1\right)}{(a+x)(a-x)} = \lim\limits_{a\to x} e^{|x|} \times 1 = e^{|x|}$

$e^{|x|} \cdot |x^2-1| = 1$

$|x^2-1| = \dfrac{1}{e^{|x|}} = e^{-|x|}$

Nishant Jindal

# $1^\infty$ form

1) $\lim_{x \to a} f(x) = 1$ & $\lim_{x \to a} g(x) = \infty$

then $\lim_{x \to a} (f(x))^{g(x)} = 1^\infty$ form

2) $1^\infty$ form's Qs can be Solved Using

2 Methods → $\lim_{x \to 0} (1+x)^{\frac{1}{x}} = e$

→ By formula

(3) M₁ $\lim_{x \to 0} (1+x)^{\frac{1}{x}} = e$ → Standard Limit

→ 1 के Baju me Jo likha hai Uska Ulta Bahardey हैं।

→ Shakl → $1^\infty$ form है।

(B) $\lim_{x \to \infty} \left(1+\frac{1}{x}\right)^x = e$

$\left(1+\frac{1}{\infty}\right)^\infty = 1^\infty$

(c) $\lim_{x \to 0} (1+ax)^{\frac{1}{x}} = ?$

$$\lim_{x \to 0} \underbrace{(1+ax)^{\frac{1}{ax}}}_{1^\infty} {}^{\times a} = e^a$$

Q $\lim_{x \to 0} (1+2x)^{\frac{1}{x}} = e^2$

Q $\lim_{x \to 0} \left(\frac{1+2x}{1+3x}\right)^{\frac{1}{x}}$

$$\lim_{x \to 0} \frac{(1+2x)^{\frac{1}{x}}}{(1+3x)^{\frac{1}{x}}} = \frac{e^2}{e^3} = e^{-1}$$

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Q $\lim_{x\to 0}\left(\dfrac{1+2x^2}{1+3x^2}\right)^{\frac{1}{x^2}}$

$$\frac{\boxed{(1+2x^2)^{\frac{1}{2x^2}}}^{\times 2}}{(1+3x^2)^{\frac{1}{3x^2}\times 3}} = \frac{e^2}{e^3} = \frac{1}{e}.$$

Q $\lim_{x\to 0}(1+\tan x)^{\cot x}$

$\lim_{x\to 0}(1+\tan x)^{\frac{1}{\tan x}}$ $\to 1^\infty$ form.

$= e$

Q $\lim_{x\to 0}(1+\tan x)^{\operatorname{cosec} x}$ $\to 1^\infty$

$$\lim_{x\to 0}\boxed{(1+\tan x)^{\frac{1}{\tan x}}}^{\times \tan x \times \operatorname{cosec} x}$$

$$e^{\lim_{x\to 0}\frac{\sin x}{\cos x}\times\frac{1}{\sin x}}$$

$$e^{\frac{1}{\cos 0}} = e$$

Q $\lim_{x\to 0}\left(\dfrac{1+\tan x}{1+\sin x}\right)^{\operatorname{cosec} x}$

$$\lim_{x\to 0}\frac{(1+\tan x)^{\operatorname{cosec} x}}{(1+\sin x)^{\operatorname{cosec} x}} = \frac{e}{e} = 1$$

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$$\lim_{x\to a} \left(f(x)\right)^{g(x)} \longrightarrow 1^{\infty} \text{ form.} \quad ; \quad \lim_{x\to a} f(x) = 1 \ \& \lim_{x\to a} g(x) \to \infty$$

$$\lim_{x\to a} \underbrace{\left(1+(f(x)-1)\right)^{\frac{1}{f(x)-1}}}_{1^{\frac{1}{0}} \to 1^{\infty}} \times (f(x)-1) \times g(x)$$

$$e^{\lim_{x\to a} g(x)(f(x)-1)}$$

$\boxed{M_2}$ याद रखना पड़ेगा

$$\boxed{\lim_{x\to a} f(x)^{g(x)} \Rightarrow e^{\lim_{x\to a} g(x)(f(x)-1)}}$$