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EXAM TARGET	SUBJECT	TIME	FACULTY
ALL PSUs	ENGINEERING MATHS	10:00 AM	ANANT SIR
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GATE 2024-25	ENVIRONMENT	8:00 PM	PRATIK SIR
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SOM	WEDNESDAY Live @8PM	MUKESH SIR
THERMODYNAMICS	THURSDAY Live @11AM	KANISTH SIR
ENGINEERING MATHEMATICS	FRIDAY Live @11AM	ANANT SIR

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Q:18 The limit of the function $f(x) = \left[1 - \frac{a^4}{x^4}\right]$ as $x \to \infty$ is given by

(a) 1
(b) $\exp[-a^4]$
(c) ∞
(d) Zero

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

$$1 - \frac{a^4}{\infty} = 1 - 0 = 1$$

Q:19 $\lim_{x\to\frac{\pi}{4}} \frac{2\times\sin\left(2\left(x-\frac{\pi}{4}\right)\right)}{2\left(x-\frac{\pi}{4}\right)} =$ _____

$\frac{\sin(2\times 0)}{0} = \frac{0}{0}$ form

$2\left(x-\frac{\pi}{4}\right)\to 0$

(a) 0 (b) $\frac{1}{2}$

(c) 1 (d) 2

$\lim_{\theta\to 0}\frac{\sin\theta}{\theta} = 1$

$\lim_{2\left(x-\frac{\pi}{4}\right)\to 0} 2\frac{\sin 2\left(x-\frac{\pi}{4}\right)}{2\left(x-\frac{\pi}{4}\right)}$ $\Rightarrow \lim_{x\to\frac{\pi}{4}} \frac{\cos\left(2\left(x-\frac{\pi}{4}\right)\times 2\right.}{1} = 2$

$= 2$

Q:20 The limit of the following sequence as $n \to \infty$ is:

$$x_n = n^{1/n}$$

(a) 0 (b) 1

(c) ∞ (d) $-\infty$

$\lim_{n\to\infty} (n)^{\frac{1}{n}} = (\infty)^0$ form

Let $y = \lim_{n\to\infty} (n)^{\frac{1}{n}}$

$\ln y = \lim_{n\to\infty} \frac{1}{n} \ln(n) = \frac{\ln(\infty)}{\infty} = \frac{\infty}{\infty}$ form

$\ln y = \lim_{n\to\infty} \frac{\frac{1}{n}}{1} = 0$

$\ln(0) = -\infty$

$\ln(0.8) = -ve$

$\ln(0.9) = -ve$ ↑ increase

$\ln(1) = 0$

$\ln(2) = +ve$

$\ln(3) = +ve$ ↓ increase

$\ln(\infty) = +\infty$

$\ln y = 0$

$y = e^0 = 1$

Q:2|

$$\lim_{x \to 0} \frac{\sin^2 x}{x}$$ is equal to

(a) 0 (b) ∞

(c) 1 (d) –1

$= \frac{\sin^2(0)}{0} = \frac{0}{0}$ form

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

Q:22

If $f(x) = \dfrac{2x^2 - 7x + 3}{5x^2 - 12x - 9}$, then $\lim\limits_{x \to 3} f(x)$ is

(a) $-1/3$

(b) $5/18$

(c) 0

(d) $2/5$

$$\frac{18 - 21 + 3}{45 - 36 - 9} = \frac{0}{0}$$

$$\lim_{x \to 3} \frac{4x - 7}{10x - 12} = \frac{5}{18}$$

Q:23

The value of $\lim_{x\to 1}\left(\frac{1-e^{-c(1-x)}}{1-xe^{-c(1-x)}}\right)$ is $\frac{0}{0}$

(a) $\frac{c}{c+1}$

(b) $\frac{c+1}{c}$

(c) c

(d) c + 1

$$\lim_{x\to 1} \frac{-c\,e^{-c(1-x)}}{-c\cdot x\,e^{-c(1-x)} - e^{-c(1-x)}} = \frac{+c}{+(c+1)}$$

Q:24

The value of $\lim_{x\to\infty} \frac{x^2-5x+4}{4x^2+2x}$ is $= \frac{\infty}{\infty}$

(a) 0 $\lim_{x\to\infty} \frac{2x-5}{8x+2} = \frac{\infty}{\infty}$ (b) $\frac{1}{4}$

(c) $\frac{1}{2}$ $\lim_{x\to\infty} \frac{2}{8} = \frac{1}{4}$ (d) 1

Q:25 The following inequality is true for all x close to 0.

$$2-\frac{x^2}{3}<\frac{x\sin x}{1-\cos x}<2$$

What is the value of $\lim_{x\to 0}\frac{x\sin x}{1-\cos x}$?

(a) 2 (b) 1/2

(c) 0 (d) 1

$$\lim_{x\to 0}\frac{x\sin x}{1-\cos x}$$

$$\frac{0}{0}$$

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

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

Q:26 Which one of the following is correct?

(a) $\lim_{x\to 0}\left(\frac{\sin 4x}{\sin 2x}\right)=2$ and $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)=1$

(b) $\lim_{x\to 0}\left(\frac{\sin 4x}{\sin 2x}\right)=\infty$ and $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)=1$

(c) $\lim_{x\to 0}\left(\frac{\sin 4x}{\sin 2x}\right)=1$ and $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)=1$

(d) $\lim_{x\to 0}\left(\frac{\sin 4x}{\sin 2x}\right)=2$ and $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)=\infty$

$\frac{0}{0}$

$\lim_{x\to 0}\frac{4\cos 4x}{2\cos 2x}=\frac{4}{2}=2$

$\lim_{x\to 0}\frac{(\sin 4x)}{(\sin 2x)}=\lim_{x\to 0}\frac{2\cos 2x}{1}=2$

$\lim_{x\to 0}\frac{\tan x}{x}=\frac{0}{0}$

$\Rightarrow \lim_{x\to 0}\frac{\sec^2 x}{1}=1$

Q:27

The value of $\lim_{x \to 0} \frac{x^3 - \sin(x)}{x}$ is $\frac{0}{0}$

(a) 0

(b) 3

(c) 1

(d) −1

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

Q:28

$$\lim_{x\to 0}\left(\frac{e^{5x}-1}{x}\right)^2 \text{ is equal to } \_\_\_\_\_.$$

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

$$\lim_{x\to 0}\frac{(e^{5x}-1)^2}{x^2}=\lim_{x\to 0}\frac{e^{10x}+1-2e^{5x}}{x^2}$$

$$\lim_{x\to 0}\frac{10e^{10x}-10e^{5x}}{2x}=\frac{0}{0}$$

$$\lim_{x\to 0}\frac{100e^{10x}-50e^{5x}}{2}=\frac{50}{2}=25$$

Q:29

$$\lim_{n\to\infty}\left(\sqrt{n^2+n}-\sqrt{n^2+1}\right) \text{ is } \underline{\quad 0.5 \quad}.$$

'$\infty-\infty$' form

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

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

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

Q:30

$$\lim_{x\to\infty}\left[\sqrt{x^2+x-1}-x\right]$$ is

'$\infty-\infty$' form

(a) 0 (b) ∞

(c) 1/2 (d) $-\infty$

$$\frac{\left(\sqrt{x^2+x-1}-x\right)\left(\sqrt{x^2+x-1}+x\right)}{\sqrt{x^2+x-1}+x}$$

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

Q:31

$$\lim_{x\to 0}\frac{\log_e(1+4x)}{e^{3x}-1}$$ is equal to

'0' form

$$\frac{0}{0}$$

$$\frac{\frac{1}{(1+4x)}\cdot 4}{3e^{3x}}$$

$$\lim_{x\to 0}\frac{4}{3e^{3x}}=\frac{4}{3}$$

(a) 0

(b) $\frac{1}{12}$

(c) $\frac{4}{3}$

(d) 1

Q:32

$$\lim_{x\to\infty}\left|1+\frac{1}{x}\right|^{2x}$$ is equal to

(a) e^{-2} (b) e

(c) 1 (d) e^2

$(1)^{\infty}$

$\ln y = \lim_{x\to\infty} 2x \ln\left|1+\frac{1}{x}\right|$

$0\times\infty$

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

$y = e^2$

Q:33

The value of $\lim_{x\to 0} \frac{1-\cos(x^2)}{2x^4}$ is

(a) 0

(b) $\frac{1}{2}$

(c) $\frac{1}{4}$

(d) undefined

THANKS FOR

Watching

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