Calculus
Final revision

Choose the correct answer

$$\lim_{x \to 3} \frac{x^2 - 8x + 15}{x - 3} = \text{..............}$$

(a) zero (b) -2 (c) does not exist. (d) 5

$$\lim_{x \to 3} \frac{\cancel{(x-3)}(x-5)}{\cancel{x-3}} = \lim_{x \to 3} (x-5)$$

$$= 3 - 5 = -2$$

Choose the correct answer

$$\lim_{x \to 3} \frac{3x^2-27}{x-3} = \dots\dots\dots\dots$$

(a) 3 (b) 6 (c) 9 (d) 18

$$\lim_{x \to 3} \frac{3(x^2-9)}{x-3} = \lim_{x \to 3} \frac{3(x+3)\cancel{(x-3)}}{\cancel{x-3}}$$

$$= \lim_{x \to 3} 3(x+3) = 3(3+3) = 18$$

Choose the correct answer

$$\lim_{x \to 2} \frac{x^2 - 3x + 2}{x^3 - 8} = \dots\dots\dots\dots$$

(a) 12 (b) $\frac{1}{12}$ (c) zero (d) not exist.

$$\lim_{x \to 2} \frac{\cancel{(x-2)}(x-1)}{\cancel{(x-2)}(x^2+2x+4)} = \frac{2-1}{4+4+4} = \frac{1}{12}$$

Choose the correct answer

$\lim\limits_{x \to 0} \frac{(2x+1)^2 - 1}{x} = \ldots\ldots\ldots\ldots\ldots$

(a) -4 (b) -3 (c) 2 (d) 4

$\lim\limits_{x \to 0} \frac{4x^2 + 4x + \cancel{1} - \cancel{1}}{x}$

$\lim\limits_{x \to 0} \frac{4\cancel{x}(x+1)}{\cancel{x}}$

$= 4(0+1)$

$= 4$

Another sol.

$2 \lim\limits_{(2x+1) \to 1} \frac{(2x+1)^2 - (1)^2}{(2x+1) - (1)}$

$2 \times \frac{2}{1} (1)^1 = 4$

Choose the correct answer

$\lim\limits_{x \to 4} \dfrac{(x-3)^2 - 1}{x-4} = \dots\dots\dots\dots$

(a) zero (b) 2 (c) 3 (d) 4

$\lim\limits_{x \to 4} \dfrac{x^2 - 6x + 8}{x-4}$

$\lim\limits_{x \to 4} \dfrac{\cancel{(x-4)}(x-2)}{\cancel{x-4}}$

$\lim\limits_{x \to 4} x-2$

$= 4 - 2 = 2$

Another sol.

$\lim\limits_{(x-3) \to 1} \dfrac{(x-3)^2 - (1)^2}{(x-3) - (1)}$

$\dfrac{2}{1} (1)^1 = 2$

Choose the correct answer

$\lim\limits_{x \to 1} \frac{2x+a}{x+1} = 5$, then a = ...

(a) 2 (b) 5 (c) 8 (d) 10

$\frac{2(1)+a}{(1)+1} = \frac{5}{1} \Rightarrow \frac{2+a}{2} = \frac{5}{1}$

$2+a = 10 \Rightarrow \boxed{a = 8}$

Choose the correct answer

If $\lim\limits_{x \to a} \dfrac{a x^2}{2} = 32$, then a = ...

(a) 2 (b) 4 (c) $4\sqrt{2}$ (d) 8

$\dfrac{a(a)^2}{2} = \dfrac{32}{1} \Rightarrow a^3 = 64$

$\therefore a = \sqrt[3]{64} = 4$

Choose the correct answer

$$\lim_{x \to k} \frac{2x^2 - x - 3}{4x^2 - 9} = \frac{5}{12}\text{, then } k = \ldots\ldots\ldots\ldots$$

(a) $\frac{3}{2}$ (b) $\frac{-3}{2}$ (c) $\frac{-2}{3}$ (d) $\frac{2}{3}$

$$\frac{2k^2 - k - 3}{4k^2 - 9} = \frac{5}{12}$$

$$24k^2 - 12k - 36 = 20k^2 - 45$$

$$4k^2 - 12k + 9 = 0$$

$$k = \frac{3}{2}$$

Another sol

$$\lim_{x \to k} \frac{\cancel{(2x-3)}(x+1)}{\cancel{(2x-3)}(2x+3)} = \frac{5}{12}$$

$$\frac{k+1}{2k+3} = \frac{5}{12}$$

$$12k + 12 = 10k + 15$$

$$2k = 3$$

$$\boxed{k = \frac{3}{2}}$$

Choose the correct answer

$-2x + ? = -8x$

If $\lim\limits_{x \to 2} \frac{x^2 - 8x + m}{x^2 - 4} = k$, then $k + m = -1 + 12 = 11$

(a) 10 (b) 11 (c) 12 (d) 13

$4 - 16 + m = 0$

$-12 + m = 0$

$m = 12$

$\lim\limits_{x \to 2} \frac{x^2 - 8x + 12}{x^2 - 4} = k$

$\lim\limits_{x \to 2} \frac{\cancel{(x-2)}(x-6)}{\cancel{(x-2)}(x+2)} = k$

$\frac{2-6}{2+2} = k$

$k = -1$

Another Sol

$\lim\limits_{x \to 2} \frac{\cancel{(x-2)}(x-6)}{\cancel{(x-2)}(x+2)} = k$

$m = -2x - 6 = 12$

$\frac{2-6}{2+2} = k$

$\boxed{k = -1}$

Choose the correct answer

$$\lim_{x \to 9} \frac{\sqrt{x}-3}{x-9} = \ldots\ldots\ldots\ldots\ldots$$

(a) $\frac{1}{6}$ (b) 6 (c) $\sqrt{3}$ (d) 9

$$\lim_{x \to 9} \frac{\cancel{\sqrt{x}-3}}{(\sqrt{x}+3)\cancel{(\sqrt{x}-3)}}$$

$$= \lim_{x \to 9} \frac{1}{\sqrt{x}+3}$$

$$= \frac{1}{\sqrt{9}+3} = \frac{1}{6}$$

Another sol

$$\lim_{x \to 9} \frac{\sqrt{x}-3}{x-9} \times \frac{\sqrt{x}+3}{\sqrt{x}+3}$$

$$\lim_{x \to 9} \frac{\cancel{x-9}}{\cancel{(x-9)}(\sqrt{x}+3)} = \frac{1}{\sqrt{9}+3}$$

$$= \frac{1}{6}$$

Choose the correct answer

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

(a) -6 (b) -8 (c) -2 (d) does not exist.

$$\lim_{x \to 2} \frac{x^2 - 6x + 8}{\sqrt{x+2} - 2} \times \frac{\sqrt{x+2} + 2}{\sqrt{x+2} + 2}$$

$$\lim_{x \to 2} \frac{(x-2)(x-4)(\sqrt{x+2} + 2)}{x + 2 - 4}$$

$$\lim_{x \to 2} \frac{\cancel{(x-2)}(x-4)(\sqrt{x+2} + 2)}{\cancel{x-2}}$$

$$= (2-4)(\sqrt{2+2} + 2)$$

$$= (-2)(4) = -8$$

Choose the correct answer

$$\lim_{x \to 1} \frac{3-\sqrt{x+8}}{1-x^2} = \text{..............}$$

(a) $\frac{1}{2}$ (b) -4 (c) $\frac{1}{6}$ (d) $\frac{1}{12}$

$$\lim_{x \to 1} \frac{3-\sqrt{x+8}}{(1+x)(1-x)} \times \frac{3+\sqrt{x+8}}{3+\sqrt{x+8}}$$

$$-(x+8)$$

$$\lim_{x \to 1} \frac{9-x-8}{(1+x)(1-x)(3+\sqrt{x+8})}$$

$$\lim_{x \to 1} \frac{\cancel{1-x}}{(1+x)\cancel{(1-x)}(3+\sqrt{x+8})}$$

$$= \frac{1}{(2)(3+\sqrt{9})} = \frac{1}{12}$$

Choose the correct answer

$$\lim_{x \to 3} \frac{x^5 - 243}{x^3 - 27} = \ldots\ldots\ldots\ldots$$

(a) 9 (b) 15 (c) $\frac{5}{3}$ (d) 45

$$\lim_{x \to 3} \frac{x^5 - 3^5}{x^3 - 3^3} = \frac{5}{3}(3)^2$$

$$= 15$$

Choose the correct answer

$\lim\limits_{x \to 3} \dfrac{x^5 - 243}{x^3 - 27} = \dots\dots\dots\dots$

(a) 9 (b) 15 (c) $\dfrac{5}{3}$ (d) 45

Choose the correct answer

$$\lim_{x \to -4} \frac{x^4 - 256}{x + 4} = \ldots\ldots\ldots\ldots$$

(a) 256 (b) 128 (c) – 256 (d) 512

$$\lim_{x \to -4} \frac{x^4 - (-4)^4}{x^1 - (-4)^1} = \frac{4}{1}(-4)^3$$

$$= -256$$

Choose the correct answer

$$\lim_{x \to 0} \frac{x^6 - 64}{x^4 - 16} = \frac{0 - 64}{0 - 16} = 4$$

(a) 2 (b) $\frac{3}{2}$ (c) 4 ~~(d) 6~~

$$\cancel{\lim_{x \to 0} \frac{x^6 - 2^6}{x^4 - 2^4} = \frac{6}{4}(2)^2 = 6}$$

Choose the correct answer

$$\lim_{3x \to -2} \frac{243x^5+32}{27x^3+8} = \ldots\ldots\ldots\ldots$$

(a) $\frac{5}{3}$ (b) $\frac{10}{3}$ (c) $\frac{-20}{3}$ (d) $\frac{20}{3}$

$$\lim_{3x \to -2} \frac{(3x)^5-(-2)^5}{(3x)^3-(-2)^3}$$

$$= \frac{5}{3}(-2)^2 = \frac{20}{3}$$

$$\lim_{x \to \frac{-2}{3}} \frac{243\left(x^5+\frac{32}{243}\right)}{27\left(x^3+\frac{8}{27}\right)}$$

$$\frac{243}{27} \times \lim_{x \to -\frac{2}{3}} \frac{x^5-\left(-\frac{2}{3}\right)^5}{x^3-\left(-\frac{2}{3}\right)^3}$$

$$9 \times \frac{5}{3} \times \left(-\frac{2}{3}\right)^2 = \frac{20}{3}$$

Choose the correct answer

$$\lim_{x \to 2} \frac{x^5 - 32}{x^2 + 3x - 10} = \ldots\ldots\ldots\ldots$$

(a) 80 (b) $\frac{80}{7}$ (c) $\frac{7}{80}$ (d) $\frac{1}{80}$

$$\lim_{x \to 2} \frac{x^5 - 32}{(x-2)(x+5)}$$

$$\lim_{x \to 2} \frac{x^5 - 2^5}{x^1 - 2^1} \times \lim_{x \to 2} \frac{1}{x+5}$$

$$\frac{5}{1}(2)^4 \times \frac{1}{2+5} = \frac{80}{7}$$

Choose the correct answer

$$\lim_{x \to 0} \frac{(x+5)^4 - 625}{x} = \ldots\ldots\ldots\ldots\ldots$$

(a) 50 (b) 250 (c) 500 (d) 125

$$\lim_{(x+5)\to 5} \frac{(x+5)^4 - 5^4}{(x+5)^1 - 5^1} = \frac{4}{1}(5)^3 = 500$$

Choose the correct answer Study

$\lim\limits_{x \to 2} \dfrac{(x+1)^4 - 81}{x^2 - 4} = \dots\dots\dots\dots$

(a) 3 (b) 9 (c) 27 (d) zero

$$\lim_{x \to 2} \frac{(x+1)^4 - (3)^4}{(x+2)(x-2)}$$

$$\lim_{x \to 2} \frac{(x+1)^4 - (3)^4}{x-2} \times \lim_{x \to 2} \frac{1}{x+2}$$

$$\lim_{(x+1) \to 3} \frac{(x+1)^4 - (3)^4}{(x+1)^1 - (3)^1} \times \lim_{x \to 2} \frac{1}{x+2}$$

$$\frac{\cancel{4}}{1} (3)^3 \times \frac{1}{\cancel{4}} = 27$$

Choose the correct answer

$$\lim_{h \to 0} \frac{(x+2h)^5 - x^5}{h} = \dots\dots\dots\dots$$

(a) $10x^4$ (b) $10x^5$ (c) $12x^4$ (d) $15x^4$

$$2 \lim_{(x+2h)\to x} \frac{(x+2h)^5 - x^5}{(x+2h)^1 - x^1} = 2 \times \frac{5}{1} \times x^4$$

$$= 10x^4$$

Choose the correct answer

$$\lim_{x \to 6} \frac{(x-5)^k - 1}{x-6} = 7 \text{ , then } k = \dots\dots\dots\dots$$

(a) 7 (b) 6 (c) 1 (d) zero

$$\lim_{(x-5)\to 1} \frac{(x-5)^k - (1)^k}{(x-5)^1 - (1)^1} = 7$$

$$\frac{k}{1}(1)^{k-1} = 7$$

$$k = 7$$

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Choose the correct answer

$$\lim_{x^2 \to a} \frac{x^{2n} - a^n}{x^2 - a} = \ldots\ldots\ldots\ldots\ldots$$

(a) $2n\,a^{n-1}$ (b) $n\,a^{2n-1}$ (c) $2n\,a^{2n-1}$ (d) $n\,a^{n-1}$

$$\lim_{x^2 \to a} \frac{(x^2)^n - (a)^n}{(x^2)^1 - (a)^1} = \frac{n}{1}\,a^{n-1}$$

$$= n\,a^{n-1}$$

Choose the correct answer

If $\lim\limits_{x \to 1} \frac{x^m - 1}{x^n - 1} = 2$ and $m + n = 12$, then $m =$ ....

(a) 2 (b) 4 (c) 8 (d) 12

$$\lim_{x \to 1} \frac{x^m - 1^m}{x^n - 1^n} = 2$$

$$\frac{m}{n}(1)^{m-n} = 2$$

$$\frac{m}{n} = 2$$

$$m = 2n$$

$$m - 2n = 0$$

$$m + n = 12$$

$m = 8$ $n = 4$

Choose the correct answer

$\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c}$

$$\lim_{x \to 1} \frac{x^{20} + x^{10} - 2}{x - 1} = \dots\dots\dots\dots$$

(a) 30 (b) 20 (c) 10 (d) 1

$$\lim_{x \to 1} \frac{x^{20} - 1^{20}}{x - 1} + \lim_{x \to 1} \frac{x^{10} - 1^{10}}{x - 1}$$

$$= \frac{20}{1}(1)^{19} + \frac{10}{1}(1)^{9}$$

$$= 20 + 10 = 30$$

Choose the correct answer

$$\lim_{x \to 1} \frac{\sqrt[5]{x} + 2\sqrt{x} - 3}{x - 1} = \dots\dots\dots\dots\dots$$

(a) $\frac{6}{5}$ (b) 2 (c) 5 (d) 3

$$\lim_{x \to 1} \frac{x^{\frac{1}{5}} - 1 + 2x^{\frac{1}{2}} - 2}{x - 1}$$

$$\lim_{x \to 1} \frac{x^{\frac{1}{5}} - 1^{\frac{1}{5}}}{x - 1} + 2\lim_{x \to 1} \frac{x^{\frac{1}{2}} - 1^{\frac{1}{2}}}{x^1 - 1^1}$$

$$\frac{1}{5}(1) + 2\left(\frac{1}{2}\right)(1)$$

$$\frac{1}{5} + 1 = \frac{6}{5}$$

Choose the correct answer

$$\lim_{x \to \infty} \left(\frac{7}{x^2} + \frac{4}{x} + 17\right) = \dots\dots\dots$$ 17

(a) 9 (b) 17 (c) zero (d) 8

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Choose the correct answer

$$\lim_{x \to \infty} \frac{x^{-3} + 2x^{-2} + 1}{2x^{-3} - x^{-1} + 3} = \dots\dots\dots\dots\dots$$

(a) 2 (b) $\frac{1}{2}$ (c) 3 (d) $\frac{1}{3}$

$$\lim_{x \to \infty} \frac{\frac{1}{x^3} + \frac{2}{x^2} + 1}{\frac{2}{x^3} - \frac{1}{x} + 3} = \frac{1}{3}$$

Choose the correct answer

$$\lim_{x \to \infty} \frac{2x^2+5x-4}{3x^2-7x+1} = \dots\dots \frac{2}{3}$$

(a) zero (b) ∞ (c) $\frac{2}{3}$ (d) $\frac{3}{2}$

Choose the correct answer

$$\lim_{x \to \infty} \frac{1}{x}\sqrt{3+4x^2} = \ldots\ldots\ldots\ldots\ldots$$

(a) 5 (b) zero (c) ∞ (d) 2

$$\lim_{x \to \infty} \frac{\sqrt{\frac{3}{x^2}+\frac{4x^2}{x^2}}}{\frac{x}{x}} = \frac{\sqrt{0+4}}{1} = 2$$

Choose the correct answer

$$\lim_{x \to \infty} \frac{2x+3}{\sqrt{9x^2+25}} = \dots\dots\dots\dots$$

(a) $\frac{2}{3}$ (b) $\frac{2}{9}$ (c) 2 (d) 3

$$\lim_{x \to \infty} \frac{\frac{2\cancel{x}}{\cancel{x}} + \frac{3}{x}}{\sqrt{\frac{9x^2}{x^2} + \frac{25}{x^2}}} = \frac{2+0}{\sqrt{9+0}} = \frac{2}{3}$$

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Choose the correct answer

$$\lim_{x \to \infty} \frac{\sqrt[3]{27x+1}}{\sqrt{16x+2}} = \ldots\ldots\ldots\ldots$$

(a) $\frac{3}{4}$ (b) zero (c) ∞ (d) $\frac{1}{2}$

$x^{\frac{1}{2}} \Rightarrow \sqrt[3]{x^{\frac{3}{2}}}$

$\sqrt{x} \Rightarrow \sqrt[3]{x^{\frac{3}{2}}}$

$$\lim_{x \to \infty} \frac{\sqrt[3]{\frac{27x}{x^{3/2}} + \frac{1}{x^{3/2}}}}{\sqrt{\frac{16x}{x} + \frac{2}{x}}} = \frac{\sqrt[3]{0+0}}{\sqrt{16+0}}$$

$$= \frac{\text{zero}}{4} = \text{zero}$$

Choose the correct answer

$$\lim_{x \to \infty} \frac{(2x+1)(4x-1)^2}{(2x+3)^3} = \dots\dots\dots\dots\dots$$

$\left(\frac{\;}{x}\right)^3$

(a) 4 (b) 64 (c) 8 (d) 32

$$\lim_{x \to \infty} \frac{\left(\frac{2\cancel{x}}{\cancel{x}} + \frac{1}{x}\right)\left(\frac{4\cancel{x}}{\cancel{x}} - \frac{1}{x}\right)^2}{\left(\frac{2\cancel{x}}{\cancel{x}} + \frac{3}{x}\right)^3} = \frac{(2+0)(4-0)^2}{(2+0)^3}$$

$$= \frac{(2)(16)}{8} = 4$$

Choose the correct answer

$$\lim_{x \to \infty} \frac{(2x+5)^3}{6+5x-4x^3} = \dots\dots\dots\dots$$

(a) 2 (b) -2 (c) $-\frac{1}{2}$ (d) $\frac{4}{3}$

$$\lim_{x\to\infty} \frac{\left(\frac{2x}{x}+\frac{5}{x}\right)^3}{\cancel{\frac{6}{x^3}}+\frac{5x}{x^3}-\frac{4x^3}{x^3}} = \frac{(2+0)^3}{0+0-4}$$

$$= \frac{8}{-4} = -2$$

Choose the correct answer

If $a < b < 0$, then $\lim\limits_{x \to \infty} \dfrac{x^a}{x^b} = \dots\dots\dots\dots$

(a) $a - b$ (b) zero (c) ∞ (d) $-\infty$

$$\lim_{x \to \infty} \frac{x^{-5}}{x^{-2}} = \lim_{x \to \infty} \frac{\cancel{x^2}/\cancel{x^5}}{x^5/\cancel{x^5}} = 0$$

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Choose the correct answer

If $a < b < 0$, then $\lim\limits_{x \to \infty} \frac{x^a}{x^b} =$ ....

(a) $a - b$ (b) zero (c) ∞ (d) $-\infty$

$$\lim_{x \to \infty} \frac{x^2 + (3a-1)x^3 + 2}{ax^3 + 5x - 3} = 2$$

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

$$3a - 1 = 2a$$

$$\boxed{a = 1}$$

Choose the correct answer

If $\lim\limits_{x \to \infty} \frac{k\,x + 5}{\sqrt{9 + 4\,x^2}} = 3$, then the value of k = ...

(a) 3 (b) 2 (c) 6 (d) 12

$\frac{k}{\sqrt{4}} = \frac{3}{1}$

$k = 3 \times 2 = 6$

Choose the correct answer

If $\lim\limits_{x \to \infty} \dfrac{4\,a\,x^{n} - 4\,x + 5}{3 - 9\,x + 8\,x^{2}} = 3$, then $\overset{2}{n} + \overset{+6}{a} =$ .... where a , n $\in \mathbb{R}$

(a) 2 (b) 4 (c) 6 (d) 8

$$\frac{4a}{8} = \frac{3}{1}$$

$$4a = 24 \Rightarrow a = 6$$

Choose the correct answer

If $\lim\limits_{x \to \infty} \frac{x^n + 6}{x^3 + 1} = \infty$, then n could be equal .... , where $n \in \mathbb{N}$

(a) 1 (b) 2 (c) 3 (d) 4

Choose the correct answer

$\lim\limits_{x \to \infty} \left(\sqrt{x^2+1} - x\right) = \ldots\ldots\ldots\ldots$

(a) zero (b) -1 (c) ∞ (d) 1

$$\lim_{x\to\infty} \frac{\sqrt{x^2+1}-x}{1} \times \frac{\sqrt{x^2+1}+x}{\sqrt{x^2+1}+x}$$

$$\lim_{x\to\infty} \frac{\cancel{x^2}+1-\cancel{x^2}}{\sqrt{x^2+1}+x}$$

$$\lim_{x\to 0} \frac{\frac{1}{x}}{\sqrt{\frac{x^2}{x^2}+\frac{1}{x^2}}+\frac{x}{x}} = \text{zero}$$

Choose the correct answer

$\lim_{x \to \infty} (5 + x - 3x^2) = \dots\dots\dots\dots$

(a) ∞ (b) -3 (c) 5 (d) $-\infty$

$5\infty - 3\infty$

$3\infty - 5\infty$

$5 + \infty - 3\infty$

$\infty - 3\infty$

Choose the correct answer

If $\lim\limits_{x \to \infty} (a x^3 + 3x - 5) = -\infty$, then a could be equal ....

(a) 2　　(b) 3　　(c) -4　　(d) zero

Choose the correct answer

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

(a) 1 (b) $\frac{1}{90°}$ (c) $\frac{2}{\pi}$ (d) zero

Choose the correct answer

$\lim\limits_{x \to 0} \frac{7+2x}{\cos x} = \frac{7+0}{1} = 7$

(a) 7 (b) 8 (c) 9 (d) 1

Choose the correct answer

$\lim\limits_{x \to \pi} x \cos x =$ .... $\pi \cos \pi = -\pi$

(a) zero (b) $-\pi$ (c) π (d) does not exist.

Choose the correct answer

$$\lim_{x \to 0} \frac{\sin 2x + 5 \tan 3x}{x} = \dots\dots\dots\dots$$

(a) 2 (b) 15 (c) 21 (d) 17

$$\lim_{x \to 0} \frac{\sin 2x}{x} + \lim_{x \to 0} \frac{5 \tan 3x}{x}$$

$$2 + 5(3) = 17$$

Choose the correct answer

$$\lim_{x \to 0} \frac{\sin \frac{x}{5}}{\tan \frac{2x}{3}} = \dots\dots\dots\dots$$

(a) $\frac{3}{10}$ (b) $\frac{10}{3}$ (c) $\frac{15}{2}$ (d) $\frac{5}{6}$

$$\lim_{x \to 0} \frac{\frac{\sin \frac{1}{5}x}{x}}{\frac{\tan \frac{2}{3}x}{x}} = \frac{\frac{1}{5}}{\frac{2}{3}} = \frac{3}{10}$$

Choose the correct answer

If $\lim\limits_{x \to 0} \frac{\tan m x}{k x} = 2$, $\lim\limits_{x \to 0} \frac{\sin k x}{n x} = 3$, then $\frac{m}{n} = \frac{2\cancel{k}}{\frac{1}{3}\cancel{k}} = 6$

(a) 6 (b) $\frac{3}{2}$ (c) $\frac{2}{3}$ (d) 1

$\frac{m}{k} = 2$ $\frac{k}{n} = \frac{3}{1}$

$\boxed{m = 2k}$ $\boxed{n = \frac{1}{3}k}$

Choose the correct answer

$\lim\limits_{x \longrightarrow 0} \frac{x \sin x + \tan 2x^2}{\cos x \sin 5x^2} = \ldots\ldots\ldots\ldots\ldots$

(a) $\frac{3}{5}$ (b) $\frac{1}{5}$ (c) 1 (d) does not exist.

$$\lim_{x \to 0} \frac{\frac{\cancel{x} \sin x}{x^{\cancel{2}}} + \frac{\tan 2x^2}{x^2}}{\cos x \frac{\sin 5x^2}{x^2}} = \frac{1+2}{(1)(5)}$$

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

Choose the correct answer

$$\lim_{x \to 0} \frac{1 - \cos x + \sin 3x}{1 - \cos x + \tan 2x} = \dots\dots\dots\dots$$

(a) zero (b) $\frac{3}{2}$ (c) 1 (d) $\frac{4}{3}$

$$\lim_{x \to 0} \frac{\boxed{\frac{1-\cos x}{x}} + \frac{\sin 3x}{x}}{\boxed{\frac{1-\cos x}{x}} + \frac{\tan 2x}{x}} = \frac{0+3}{0+2}$$

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

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Choose the correct answer

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

(a) zero (b) 1 (c) 2 (d) $-\frac{1}{2}$

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

Choose the correct answer

$$\lim_{x \to 0} \frac{5x^3 + \sin^2 4x}{6x^3 + \tan 2x^2} = \dots\dots\dots\dots$$

(a) 9 (b) 8 (c) 7 (d) 6

$$\lim_{x \to 0} \frac{\frac{5\cancel{x^3}}{\cancel{x^2}} + \left(\frac{\sin 4x}{x}\right)^2}{\frac{6\cancel{x^3}}{\cancel{x^2}} + \frac{\tan 2x^2}{x^2}} = \frac{0 + 16}{0 + 2}$$

$$= 8$$

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Choose the correct answer

$$\lim_{x \to 0} \frac{\sin 5x}{\log_3 9^x} = \dots\dots\dots\dots$$

(a) 5 (b) $\frac{5}{3}$ (c) $\frac{5}{9}$ (d) $\frac{5}{2}$

$$\lim_{x \to 0} \frac{\sin 5x}{x \log_3 9} = \lim_{x \to 0} \frac{\sin 5x}{x} \times \lim_{x \to 0} \frac{1}{\log_3 9}$$

$$= 5 \times \frac{1}{2} = \frac{5}{2}$$

Choose the correct answer

$\lim\limits_{x \to 0} \dfrac{1-\sec x}{\cos x - 1} = \ldots\ldots\ldots\ldots\ldots$

(a) 2 (b) 1 (c) zero (d) – 1

$1+\tan^2\theta = \sec^2\theta$

$1-\sec^2\theta = -\tan^2\theta$

$$\lim_{x\to 0} \frac{1-\sec x}{\cos x - 1} \times \frac{1+\sec x}{1+\sec x}$$

$$\lim \frac{1-\sec^2 x}{\cos x + \cancel{1} - \cancel{1} - \sec x} = \lim \frac{-\tan^2 x}{\frac{\cos x}{1} - \frac{1}{\cos x}}$$

$$\lim_{x\to 0} \frac{-\tan^2 x}{\frac{\cos^2 x - 1}{\cos x}} = \lim_{x\to 0} \frac{\cancel{-}\cos x \; \frac{\tan^2 x}{x^2}}{\cancel{-}\frac{\sin^2 x}{x^2}}$$

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

Choose the correct answer

$$\lim_{x \to 3} \frac{\sin(2x-6)}{x^2-9} = \dots\dots\dots\dots$$

(a) $\frac{2}{3}$ (b) $\frac{1}{3}$ (c) $\frac{2}{9}$ (d) 1

$$\lim_{(x-3)\to 0} \left(\frac{\sin 2(x-3)}{x-3} \times \frac{1}{x+3} \right)$$

$$2 \times \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$$

Choose the correct answer

If $\lim\limits_{x \to 0} \frac{1}{2x \csc 6x} = \ldots\ldots\ldots\ldots\ldots$

(a) 12 (b) $\frac{1}{12}$ (c) 3 (d) $\frac{1}{3}$

$$\lim_{x \to 0} \frac{\sin 6x}{2x} = \frac{6}{2} = 3$$

Choose the correct answer

$\cos x = \sin\left(\frac{\pi}{2} - x\right)$

$$\lim_{x \to \frac{\pi}{2}} \frac{\cos x}{\pi - 2x} = \ldots\ldots\ldots\ldots$$

(a) 2 (b) $\frac{2}{\pi}$ (c) $\frac{1}{2}$ (d) $\frac{\pi}{2}$

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

Choose the correct answer

$\lim\limits_{x \to \frac{\pi}{2}} \dfrac{\cot x}{x - \frac{\pi}{2}} = \dots\dots\dots\dots\dots$

(a) -1 (b) 1 (c) $\dfrac{\pi}{2}$ (d) π

$\cot x = \tan(\frac{\pi}{2} - x)$

$\lim\limits_{(\frac{\pi}{2} - x) \to 0} \dfrac{\tan(\frac{\pi}{2} - x)}{-(\frac{\pi}{2} - x)} = -1$

Choose the correct answer

If $\lim\limits_{x \to 0} \dfrac{1-\cos^2 bx}{3x^2+\tan x^2} = 16$, then b = ……………

(a) ± 8 (b) 8 (c) 4 (d) 2

$$\lim_{x \to 0} \frac{\left(\frac{\sin bx}{x}\right)^2}{\frac{3x^2}{x^2}+\frac{\tan x^2}{x^2}} = 16$$

$$\frac{b^2}{3+1} = \frac{16}{1}$$

$$b^2 = 64$$

$$b = \pm 8$$

Choose the correct answer

If $f(x) = \begin{cases} x^2 - 1 & , \quad x > 2 \\ 3x + 1 & , \quad x \le 2 \end{cases}$, then $\lim_{x \to 2} f(x) = \text{.............}$

(a) does not exist. ~~(b) 3~~ (c) 8 ~~(d) 7~~

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

$f(2)^- = \lim_{x \to 2} 3x + 1 = 7$

Choose the correct answer

If $f : f(X) = \begin{cases} 3X - 1 & , X < 2 \\ 6 & , X > 2 \end{cases}$, then $\lim\limits_{x \to 2} f(X) =$ ....

(a) 5 (b) 6 (c) -5 (d) does not exist.

$f(2^-) = \lim\limits_{x \to 2^-} 3x - 1 = 6 - 1 = 5$

$f(2^+) = 6$

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Choose the correct answer

If $f : f(x) = \begin{cases} x + 1 & , \quad x > a \\ 3x - 7 & , \quad x < a \end{cases}$, and $\lim\limits_{x \to a} f(x)$ exists , then a = ...

(a) 2 (b) 4 (c) – 4 (d) 8

$a + 1 = 3a - 7$

$1 + 7 = 3a - a$

$2a = 8 \Longrightarrow a = 4$

Choose the correct answer

If $f : f(x) = \begin{cases} 3x^2 + ax - 2 & , \quad x > 3 \\ 2x + b & , \quad x < 3 \end{cases}$ and $\lim_{x \to 3} f(x) = 16$, then $\overset{-3+10}{a + b} = \cdots\cdots$

(a) 4 (b) 7 (c) -1 (d) 13

$f(3)^+ = 27 + 3a - 2 = 16$

$3a = 16 - 25$

$3a = -9 \Rightarrow \boxed{a = -3}$

$f(3)^- = 2(3) + b = 16$

$6 + b = 16$

$\boxed{b = 10}$

Choose the correct answer

If $f : f(x) = \begin{cases} \dfrac{\sin^2 2x}{x^2} & , \quad x < 0 \\ 2a + 3\cos x & , \quad x > 0 \end{cases}$ and $\lim\limits_{x \to 0} f(x)$ exists , then a = ...

(a) $\frac{1}{2}$ (b) zero (c) 2 (d) $\frac{-1}{2}$

Choose the correct answer

If $f : f(x) = \begin{cases} \frac{|x|}{x} + 6 & , \quad x < 0 \\ a + \cos 3x & , \quad x > 0 \end{cases}$ has a limit at $x = 0$, then a = ...

(a) 4 (b) – 4 (c) 2 (d) – 2

Choose the correct answer

If $f(x) = \begin{cases} a\,x^2 + 9 & , \ x \neq 1 \\ 4\,a & , \ x = 1 \end{cases}$ is continuous at $x = 1$, then a = ……………

(a) 1 (b) 3 (c) 9 (d) 36

Choose the correct answer

If $f : f(x) = \begin{cases} \dfrac{x^4 - 81}{x^2 - 9} & , \quad x < 3 \\ x^2 + x + k & , \quad x \geq 3 \end{cases}$ is continuous at $x = 3$, then k = ...

(a) 3 (b) 6 (c) 9 (d) 14

Choose the correct answer

The function $f : f(X) = \dfrac{2}{X^2 - 6X + k}$ is continuous on $\mathbb{R}$, then ....

(a) $k \le 9$ (b) $k \ge 9$ (c) $k < 9$ (d) $k > 9$

$x^2 - 6x + k$

$a = 1$ $b = -6$ $c = k$

$D = b^2 - 4ac < 0$

$36 - 4k < 0$

$-4k < -36$

$k > 9$

Choose the correct answer

If $f : f(X) = \dfrac{X + 4}{X^2 + k}$ is continuous on $\mathbb{R}$, then k could be equal ....

(a) – 9 (b) zero (c) – 4 (d) 9