GOVERNMENT OF KARNATAKA

DEPARTMENT OF SCHOOL EDUCATION (PRE-UNIVERSITY)

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CHAPTERWISE MULTIPLE CHOICE QUESTIONS FOR COMPETATIVE EXAM

SUBJECT: MATHEMATICS – I PUC

NAME OF THE CHAPTER: LIMITS AND DERIVATIVES

RECAP

➢ *Limit of a Function:-*

$\lim_{x \to a} f(x) = l$. This means that when x is close to a, $f(x)$ is close to l.

➢ *Left-Hand Limit (LHL):-*

$\lim_{x \to a^-} f(x) = f(a-0) = l_1$. This means that when $x \to a$ from the left, $f(x)$ is close to l_1.

➢ *Right-Hand Limit (RHL):-*

$\lim_{x \to a^+} f(x) = f(a+0) = l_2$. This means that when $x \to a$ from the right, $f(x)$ is close to l_2.

NOTE: The limit exists when LHL = RHL $= l$.

➢ *Algebra of Limits:-*

If, $\lim_{x \to a} f(x) = f(a) = l$ and $\lim_{x \to a} g(x) = g(a) = m$, where l and m are real numbers.

- $\lim_{x \to a}\left[f(x) \pm g(x)\right] = f(a) \pm g(a) = l \pm m$
- $\lim_{x \to a}\left[f(x) * g(x)\right] = f(a) * g(a) = l * m$
- $\lim_{x \to a}\left[kf(x)\right] = kf(a) = k \cdot l$
- If $\lim_{x \to a}\left[\frac{f(x)}{g(x)}\right] = \frac{f(a)}{g(a)} = \frac{l}{m}, m \neq 0$
- If $\lim_{x \to a} f(x) = \pm\infty$ then $\lim_{x \to a} \frac{1}{f(x)} = 0$
- $\lim_{x \to a}\left[f(x)\right]^{g(x)} = \left[\lim_{x \to a} f(x)\right]^{g(x)} = l^m$
- $\lim_{x \to a}\left|f(x)\right| = \left|\lim_{x \to a} f(x)\right| = |l|$
- If $f(x) \leq g(x), \forall x$ then $\lim_{x \to a} f(x) \leq \lim_{x \to a} g(x)$.
- If $f(x) \leq g(x) \leq h(x), \forall x$ and $\lim_{x \to a} f(x) = \lim_{x \to a} h(x) = l$ then $\lim_{x \to a} g(x) = l$.

  This result is known as the **Sandwich (Squeeze) Theorem**.
- $\lim_{x \to a} f(g(x)) = f\left(\lim_{x \to a} g(x)\right) = f(m)$ Provided f is continuous at $g(x) = m$.

L-HOSPITAL'S Rule:-

If $f(x)$ and $g(x)$ are two continuous and differentiable functions at $x = a$ and

$\lim_{x\to a} \frac{f(x)}{g(x)} = \frac{0}{0}$ or $\frac{\infty}{\infty}$, Then $\boxed{\lim_{x\to a} \frac{f(x)}{g(x)} = \lim_{x\to a} \frac{f'(x)}{g'(x)}}$

[i.e., Differentiate the numerator and denominator separately and apply the rule repeatedly until the indeterminate form is removed]

Limits at infinity:-

- As $n \to \infty, \frac{1}{n} \to 0$
- $\lim_{n\to\infty} a^n = \begin{cases} 0, & |a| < 1, \\ 1, & a = 1, \\ \infty, & a > 1. \end{cases}$
- $\lim_{n\to\infty} \frac{1}{n^p} = 0, where\ p > 0$
- $\lim_{n\to\infty} n^{\frac{1}{n}} = 1.$
- If $a > 0,\ b > 0, \lim_{n\to\infty} (a^n + b^n)^{1/n} = a.$
- $\lim_{n\to\infty} \frac{a_0 x^m + a_1 x^{m-1} + \dots\dots + a_{mn}}{b_0 x^n + b_1 x^{n-1} + \dots\dots + b_n} = \begin{cases} \frac{a_0}{b_0}, & if\ n = m, \\ 0, & m < n, \\ \infty, & m > n,\ a_0 b_0 > 0, \\ -\infty, & m > n,\ a_0 b_0 < 0. \end{cases}$
- If $a > b > c > 0,\ \lim_{n\to\infty} (a^n + b^n + c^n)^{1/n} = a.$
- $\lim_{x\to a} \frac{x^n - a^n}{x - a} = na^{n-1},\ n \in Q.$
- $\lim_{x\to a} \frac{x^m - a^m}{x^n - a^n} = \frac{m}{n} a^{m-n}.$

Trigonometric Limits:-

- $\lim_{x\to 0} \frac{\sin x}{x} = \lim_{x\to 0} \frac{x}{\sin x} = 1$
- $\lim_{x\to 0} \frac{\tan x}{x} = \lim_{x\to 0} \frac{x}{\tan x} = 1$
- $\lim_{x\to 0} \frac{\sin^{-1} x}{x} = \lim_{x\to 0} \frac{x}{\sin^{-1} x} = 1$
- $\lim_{x\to a} \frac{\sin(x-a)}{x-a} = \lim_{x\to a} \frac{\tan(x-a)}{x-a} = 1$
- $\lim_{x\to 0} \frac{\sin mx}{\tan mx} = \lim_{x\to 0} \frac{\tan^{-1} mx}{\sin^{-1} nx} = \lim_{x\to 0} \frac{\sin^{-1} mx}{\tan^{-1} nx} = \frac{m}{n}$
- $\lim_{x\to\infty} \frac{\sin x}{x} = \lim_{x\to\infty} \frac{\cos x}{x} = 0$
- $\lim_{x\to\infty} \frac{\sin\left(\frac{1}{x}\right)}{\left(\frac{1}{x}\right)} = \lim_{x\to\infty} x \cdot \sin\left(\frac{1}{x}\right) = 1$
- $\lim_{x\to 0} \frac{\sin x^0}{x} = \frac{\pi}{180}$
- $\lim_{x\to 0} \frac{1-\cos x}{x} = 0$
- $\lim_{x\to 0} \frac{1-\cos x}{x^2} = \frac{1}{2}$
- $\lim_{x\to 0} \frac{1-\cos px}{x^2} = \frac{p^2}{2}$
- $\lim_{x\to 0} \frac{1-\cos px}{1-\cos qx} = \frac{p^2}{q^2}$
- $\lim_{x\to 0} \frac{\cos(ax)-\cos(bx)}{x^2} = \frac{b^2-a^2}{2}$
- $\lim_{x\to 0} \frac{\tan x - \sin x}{x^3} = \frac{1}{2}$

Logarithmic and Exponential Limits:-

- $\lim_{x\to 0}\frac{\log(1+x)}{x}=\lim_{x\to e}\log_e x=\lim_{x\to 0}\frac{e^x-1}{x}=1$
- $\lim_{x\to\infty}\left[1+\frac{1}{x}\right]^x=\lim_{x\to 0}(1+x)^{1/x}=e$
- $\lim_{x\to 0}(1+\lambda x)^{1/x}=\lim_{x\to\infty}\left[1+\frac{\lambda}{x}\right]^x=e^\lambda$
- $\lim_{x\to 0}\frac{a^x-1}{x}=\log_e a,\ a>0,\ a\neq 1$
- $\lim_{x\to a}[f(x)]^{g(x)}=e^{\lim_{x\to a} g(X)\cdot\log f(x)}$
- $\lim_{x\to\infty}\left(\frac{x+\alpha}{x+\beta}\right)^x=e^{\alpha-\beta}$

Derivative of a Function:-

- Let $y=f(x)$ is a real-valued function. Then at $\boldsymbol{x=c}$**,**, $\frac{dy}{dx}=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ (if the limit exists)
- The derivative of a function is also defined as at $x=c$, $\frac{dy}{dx}=\lim_{x\to c}\frac{f(x)-f(c)}{x-c}$

Algebra of Derivative of functions:-

Let u and v be differentiable functions of x and let k be a constant, then

- $\frac{d}{dx}(k)=0$ and $\frac{d}{dx}(ku)=k\frac{du}{dx}$ where k is a constant.
- $\frac{d}{dx}(u\pm v)=\frac{du}{dx}\pm\frac{dv}{dx}$
- $\frac{d}{dx}(u*v)=u\frac{dv}{dx}+v\frac{du}{dx}$ [Product rule]
- $\frac{d}{dx}\left(\frac{u}{v}\right)=\frac{v\frac{du}{dx}-u\frac{dv}{dx}}{v^2}$, $v\neq 0$ [Quotient rule]

Think & Discuss MCQs

1. $\lim_{x\to 3}\left[\frac{1}{x-2}+\frac{1}{x+3}\right]=$ (Easy)

A) $\frac{7}{6}$ B) 5 C) $\frac{1}{4}$ D) $\frac{3}{7}$

2. $\lim_{x\to 0}\frac{\log(1+ax)}{x}=$ (Easy)

A) 0 B) $\frac{1}{a}$ C) a D) $-\frac{1}{a}$

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

A) 1 B) $\frac{1}{2}$ C) $\frac{2}{3}$ D) $\frac{3}{2}$

4. $\lim_{x\to 1}\frac{x^2-1}{|x-1|}=$ (Average)

A) 2 B) 0 C) 1 D) Doesn't exist

5. **The value of** $\lim_{x\to 0}\frac{[x]}{x}=$ ***KCET 2018*** **-** (Easy)

A) 1 B) -1 C) 0 D) Doesn't exist

6. $\lim_{x\to 1}\frac{x^4-\sqrt{x}}{\sqrt{x}-1}=$ ***KCET 2025*** **-** (Average)

A) 0 B) $\frac{1}{2}$ C) 7 D) Doesn't exist

7. $\lim_{y\to 0}\frac{\sqrt{3+y^3}-\sqrt{3}}{y^3}=$ ***KCET 2022*** **-** (Easy)

A) $2\sqrt{3}$ B) $\frac{3}{\sqrt{2}}$ C) $3\sqrt{2}$ D) $\frac{1}{2\sqrt{3}}$

8. $\lim_{x\to 0}\frac{e^{ax}-e^{-bx}}{x}=$ (Easy)

A) $a+b$ B) $a-b$ C) $\frac{a}{b}$ D) ab

9. $\lim_{x\to 0}\frac{\sqrt[3]{8+x}-2}{x}=$ (Average)

A) 0 B) 1 C) $\frac{1}{12}$ D) $\frac{-1}{12}$

10. $\lim_{x\to 0}\frac{\sqrt{1+x+x^2}-1}{x}=$ (Average)

A) 0 B) 1 C) 2 D) $\frac{1}{2}$

11. $\lim_{x\to 0}\frac{\sqrt{1+x^3}-\sqrt{1-x^3}}{x^3}=$ **(Average)**

A) 0 B) 1 C) 2 D) $\frac{1}{2}$

12. $\lim_{x\to 0}\frac{\sqrt[3]{1+x}-\sqrt[3]{1-x}}{x}=$ **(Average)**

A) 1 B) $\frac{1}{2}$ C) $\frac{2}{3}$ D) $\frac{3}{2}$

13. $\lim_{x\to 0}\frac{x}{\sqrt{x+4}-2}=$ **(Average)**

A) 4 B) $\sqrt{2}$ C) $\frac{1}{3}$ D) $\frac{-1}{6}$

14. $\lim_{x\to 8}\frac{\sqrt{1+\sqrt{1+x}}-2}{x-8}=$ **(Difficult)**

A) $\frac{3}{2}$ B) $\frac{1}{4}$ C) $\frac{1}{24}$ D) ∞

15. $\lim_{x\to 0}\frac{\log(1+x)}{3^x-1}=$ ***KCET 2013*** **- (Easy)**

A) $\log_e 3$ B) 0 C) $\log_3 e$ D) 1

16. $\lim_{x\to 0}\frac{x2^x-x}{1-\cos x}=$ ***KCET 2012*** **- (Difficult)**

A) $2\log_e 2$ B) $\log 2$ C) $\frac{1}{2}\log 2$ D) $\frac{1}{2}$

17. $\lim_{x\to 0}\frac{\sqrt{a+2x}-\sqrt{3x}}{\sqrt{3a+x}-2\sqrt{x}}=$ ***KCET 2012*** - **(Easy)**

A) $\frac{2}{3}$ B) $\frac{1}{\sqrt{3}}$ C) $\frac{3\sqrt{3}}{2}$ D) $\frac{2}{3\sqrt{3}}$

18. $\lim_{n\to\infty}\frac{3.2^{n+1}-4.5^{n+1}}{5.2^n+7.5^n}=$ ***KCET 2009*** - **(Average)**

A) $\frac{3}{5}$ B) $-\frac{4}{7}$ C) $-\frac{20}{7}$ D) 0

19. $\lim_{x\to\pi}\frac{\sin x}{x-\pi}=$ **(Average)**

A) 1 B) 2 C) -1 D) -2

20. $\lim_{x\to 0}x\sin\left(\frac{1}{x}\right)=$ **(Average)**

A) 0 B) 1 C) $\frac{1}{2}$ D) Doesn't exist

21. $\lim_{x\to\frac{\pi}{2}} \frac{\sin x}{x} =$ **(Easy)**

A) 1 B) $\frac{2}{\pi}$ C) $\frac{\pi}{2}$ D) $\frac{1}{2}$

22. $\lim_{x\to 0} \frac{\sin x^0}{x} =$ **(Average)**

A) 1 B) $\frac{\pi}{2}$ C) $\frac{\pi}{180}$ D) $\frac{180}{\pi}$

23. $\lim_{x\to 0} x\sin\left(\frac{2}{x}\right) =$ ***KCET 2008*** - **(Easy)**

A) ∞ B) $\frac{1}{2}$ C) 2 D) 0

24. $\lim_{x\to\frac{\pi}{2}} \frac{1-\sin x}{\cos x} =$ **(Easy)**

A) 0 B) -1 C) 1 D) Doesn't exist

25. $\lim_{x\to\frac{\pi}{2}} \frac{1-\cos x}{x^2} =$ **(Easy)**

A) $\frac{\pi^2}{2}$ B) $\frac{\pi^2}{4}$ C) $\frac{4}{\pi^2}$ D) $\frac{4}{\pi}$

26. $\lim_{\theta\to 0} \frac{1-\cos 4\theta}{1-\cos 6\theta} =$ **(Average)**

A) $\frac{4}{9}$ B) $\frac{1}{2}$ C) $-\frac{1}{2}$ D) 1

27. $\lim_{x\to 0} \frac{\operatorname{cosec} x - \cot x}{x} =$ **(Average)**

A) $-\frac{1}{2}$ B) 1 C) $\frac{1}{2}$ D) 1

28. $\lim_{x\to\frac{\pi}{4}} \frac{\sec^2 x - 2}{\tan x - 1} =$ **(Easy)**

A) 3 B) 1 C) 0 D) 2

29. $\lim_{x\to 1} \frac{\tan(x^2-1)}{(x-1)} =$ ***KCET 2007*** - **(Easy)**

A) 2 B) $\frac{1}{2}$ C) -2 D) $-\frac{1}{2}$

30. $\lim_{x\to 0} \frac{\sin x}{x(1+\cos x)} =$ **(Easy)**

A) 0 B) $\frac{1}{2}$ C) 1 D) -1

31. $\lim_{x\to 0}\frac{xe^x-\sin x}{x}=$ **KCET 2016 - (Easy)**

A) 3 B) 1 C) 0 D) 2

32. $\lim_{x\to 0}\frac{\sin^2\left(\frac{x}{3}\right)}{x}=$ **(Average)**

A) $\frac{1}{3}$ B) $\frac{1}{9}$ C) 9 D) 0

33. $\lim_{\theta\to 0}\frac{\sin 2\theta\sin 3\theta}{3\theta\tan 4\theta}=$ **(Average)**

A) $\frac{2}{3}$ B) $\frac{3}{2}$ C) 2 D) $\frac{1}{2}$

34. $\lim_{x\to 0}\frac{\sin(2+x)-\sin(2-x)}{x}=A\cos B$ **then the values of A and B respectively**

A) 1,2 B) 2,1 C) 1,1 D) 2,2 **(Average)**

35. $\lim_{x\to 0}\frac{\tan 2x-x}{3x-\sin x}=$ **(Average)**

A) 2 B) $\frac{1}{2}$ C) $-\frac{1}{2}$ D) $\frac{1}{4}$

36. $\lim_{\theta\to 0}\frac{\cos 5\theta-\cos 7\theta}{\theta^2}=$ **(Easy)**

A) $\frac{1}{6}$ B) $\frac{1}{12}$ C) 12 D) 6

37. $\lim_{x\to 0}\frac{x^2\cos x}{1-\cos x}=$ **(Average)**

A) 2 B) $\frac{3}{2}$ C) $-\frac{3}{2}$ D) 1

38. $\lim_{x\to\frac{\pi}{4}}\frac{\sqrt{2}\cos x-1}{\cot x-1}=$ **KCET 2024 - (Easy)**

A) 2 B) $\frac{1}{2}$ C) $\frac{1}{\sqrt{2}}$ D) $\sqrt{2}$

39. $\lim_{x\to 0}\frac{\sin x}{\sqrt{x+1}-\sqrt{1-x}}=$ **(Average)**

A) 2 B) 0 C) 1 D) -1

40. $\lim_{x\to 0}\frac{|\sin x|}{x}=$ **(Average)**

A) 1 B) -1 C) 0 D) Doesn't exist

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

A) 4 B) $\frac{1}{4}$ C) 16 D) $\frac{1}{16}$

42. $\lim_{x\to 0}\frac{3\sin x-\sin 3x}{x^3}=$ (Average)

A) 4 B) -4 C) 8 D) -8

43. $\lim_{x\to 0}\frac{\tan x-\sin x}{x^2}=$ (Easy)

A) 0 B) 1 C) $\frac{1}{2}$ D) $-\frac{1}{2}$

44. $\lim_{x\to 0}\frac{\tan x-\sin x}{x^3}=$ (Average)

A) 0 B) 1 C) 2 D) $\frac{1}{2}$

45. $\lim_{x\to 0}\frac{\tan^3 x-\sin^3 x}{x^5}=$ (Average)

A) $\frac{5}{2}$ B) $\frac{3}{2}$ C) $\frac{3}{5}$ D) $\frac{2}{5}$

46. $\lim_{\theta\to\frac{\pi}{2}}\frac{1-\sin\theta}{\cos\left(\frac{\pi}{2}-\theta\right)}=$ (Easy)

A) 1 B) -1 C) 0 D) $\frac{1}{2}$

47. $\lim_{x\to 0}\frac{\sin 2x+a\sin x}{x^3}\,is$ (Average)

A) 2 B) -2 C) -1 D) $\frac{1}{2}$

48. $\lim_{x\to 1}(1+\sin \pi x)^{\cot \pi x}=$ (Average)

A) 0 B) 1 C) e D) $\frac{1}{e}$

49. $\lim_{x\to 3}\left[\frac{x^2-ax-3b}{x-3}\right]=5$ **then** $a+b=$ ***KCET 2026 -*** (Average)

A) -2 B) 2 C) 3 D) 4

50. The function $f(x)=\frac{\log(1+ax)-\log(1-bx)}{x}$ **is not defined at** $x=0$. **The value which should be assigned to f at** $x=0$ **so that it is continuous at** $x=0$ **is** ***KCET 2009 -*** (Easy)

A) $a+b$ B) $a-b$ C) 0 D) $\log a+\log b$

51. $\lim_{x\to 0}\frac{(1+x)^n-1}{x}$ **is equal to** (Easy)

A) n B) 1 C) $-n$ D) 0

52. $\lim_{x\to 0}\frac{[\sin x]}{x}=$ (Average)

A) 1 B) -1 C) 0 D) *Doesn't exist*

53. If $[x]$ **is the greatest integer function, then** $\lim_{x\to 0}[x]$ **is** (Easy)

A) 0 B) 2 C) -1 D) *Doesn't exist*

54. $\lim_{x\to 1}[x-1]$, **where** $[.]$ **is the greatest integer function, is equal to** (Easy)

A) 1 B) 2 C) 0 D) *Doesn't exist*

55. $\lim_{x\to 1}\frac{x^m-1}{x^n-1}$ **is equal to** (Easy)

A) 1 B) $\frac{m}{n}$ C $-\frac{m}{n}$ D) $\frac{m^2}{n^2}$

56. $\lim_{x\to 0}(1+2x)^{\frac{1}{x}}$ **is** (Easy)

A) e B) e^2 C) e^3 D) $-e$

57. $\lim_{x\to 1}\frac{(\sqrt{x}-1)(2x-3)}{2x^2+x-3}$ **is** (Average)

A) $\frac{1}{10}$ B) $\frac{-1}{10}$ C) 1 D) -1

58. $\lim_{x\to 0}\frac{\log(3+x)-\log(3-x)}{x}=k$ **Then** $k=$ (Average)

A) 0 B) $\frac{1}{3}$ C) $\frac{2}{3}$ D) $-\frac{2}{3}$

59. $\lim_{x\to 0}\frac{a^x-b^x}{x}$ **is** (Easy)

A) 0 B) 1 C) $\log\left(\frac{a}{b}\right)$ D) $\frac{\log a}{\log b}$

60. $\lim_{x\to\infty}\left(1+\frac{3}{x}\right)^x$ **is** (Easy)

A) 1 B) e^2 C) e^6 D) $-e$

61. $\lim_{x\to\infty}\left(\frac{x+a}{x+b}\right)^{x+b}$ **is** (Average)

A) 1 B) e^{b-a} C) e^{a-b} D) e^b

62. $\lim_{x\to\infty}\left(\frac{x}{1+x}\right)^x =$ **(Average)**

A) 0 B) e^{-1} C) e D) e^2

63. **If** $0 < p < q$ **then** $\lim_{x\to\infty}\left(q^n + p^n\right)^{\frac{1}{n}} =$ **(Average)**

A) e B) p C) q D) 0

64. $\lim_{x\to\infty}\frac{1^2+2^2+3^2+\_\_\_+n^2}{n^3} =$ **(Easy)**

A) 1 B) $\frac{1}{2}$ C) $\frac{1}{3}$ D) $\frac{1}{4}$

65. $\lim_{n\to\infty}\frac{n(1^3+2^3+3^3+\_\_\_+n^3)}{\left(1^2+2^2+3^2+\_\_\_\_+n^2\right)^3} =$ **(Average)**

A) $\frac{27}{16}$ B) $\frac{16}{27}$ C) 0 D) $\frac{4}{9}$

66. $\lim_{x\to\infty}\frac{1^3+2^3+3^3+\_\_\_+n^3}{n^4} =$ **(Easy)**

A) 1 B) $\frac{1}{2}$ C) $\frac{1}{3}$ D) $\frac{1}{4}$

67. $\lim_{n\to\infty}\left[\frac{n}{n^2+1^2}+\frac{n}{n^2+2^2}+\frac{n}{n^2+3^2}+\_\_\_\_+\frac{1}{5n}\right]=$ ***KCET 2024*** **- (Difficult)**

A) $\frac{\pi}{4}$ B) $tan^{-1}3$ C) $\frac{\pi}{2}$ D) $tan^{-1}2$

68. $\lim_{n\to\infty}\frac{\left(1^2+2^2+3^2+4^2+\_\_\_+n^2\right)(n)^{\frac{1}{n}}}{(n+1)(n+10)(n+100)} =$ **(Average)**

A) 0 B) $\frac{1}{3}$ C) $\frac{2}{3}$ D) ∞

69. $\lim_{n\to\infty}\frac{1+2+3+\_\_\_+n}{n^2}$ $n \in N$ **is equal to** **(Easy)**

A) 0 B) $\frac{1}{2}$ C) 1 D) $\frac{1}{4}$

70. $\sum_{r=1}^{n}(2r-1)=x$ **then** $\lim_{n\to\infty}\left[\frac{1^3}{x^2}+\frac{2^3}{x^2}+\frac{3^3}{x^2}+\_\_\_\_+\frac{n^3}{x^2}\right]=$ ***KCET 2019*** **- (Difficult)**

A) $\frac{1}{4}$ B) 4 C) $\frac{1}{2}$ D) 11

71. $\lim_{n\to\infty}\left(n.\sin\frac{2\pi}{3n}\cos\frac{2\pi}{3n}\right)=$ **KCET 2010 - (Easy)**

A) $\frac{\pi}{6}$ B) $\frac{2\pi}{3}$ C) 1 D $\frac{\pi}{3}$

72. If $f(x)=9-x^2$ **then** $\lim_{x\to2}\frac{f(2)-f(x)}{x-2}$ **is** **(Easy)**

A) -2 B) 2 C) 4 D) -4

73. If the function $f(x)$ **satisfies** $\lim_{x\to1}\frac{f(x)-2}{x^2-1}=\pi$ **then** $\lim_{x\to1}f(x)=$ **(Easy)**

A) 2 B) 3 C) 1 D) 0

74. If $f(x)=\begin{cases}x^2-1, & if\ \ x\geq2\\ x+1, & if\ \ x<2\end{cases}$ **then** $\lim_{x\to1}f(x)+\lim_{x\to2}f(x)=$ **KCET 2026 - (Average)**

A) 3 B) 5 C) 7 D) 9

75. Let $f(x)=\begin{cases}x^2-1, & if\ \ 0<x<2\\ 2x+3, & if\ \ 2\leq x<3\end{cases}$ **the quadratic equation whose roots are** $\lim_{x\to2^-}f(x)$ **and** $\lim_{x\to2^+}f(x)$ **(Average)**

A) $x^2-6x+9=0$ B) $x^2-7x+8=0$

C) $x^2-14x+49=0$ D) $x^2-10x+21=0$

76. If $f(x)=\begin{cases}\frac{\sin[x]}{[x]} & ,[x]\neq0\\ 0 & ,[x]=0\end{cases}$ **, where** $[.]$ **denotes the greatest integer function then** $\lim_{x\to0}f(x)$ **is equal to** **(Average)**

A) 1 B) 0 C) -1 D) $Doesn't\,exist$

77. If $f:R\to R$ **is continuous such that** $f(x+y)=f(x)f(y)\ \ \forall x,y\in R$ **and** $f(1)=2$ **then** $f(100)=$ **(Easy)**

A) 100 B) 50 C) 200 D) 2^{100}

78. Let the function satisfy the equation $f(x+y)=f(x)f(y)\ \ \forall x,y\in R$ **where** $f(0)\neq0.$ **If** $f(5)=3$ **and** $f'(0)=2,$ **then** $f'(5)=$ **KCET 2026 - (Difficult)**

A) 1 B) 0 C) -1 D) 6

79. Statement 1: $\lim_{x\to 1}\left(\frac{ax^2+bx+c}{cx^2+bx+a}\right)=1 \quad (where\ a+b+c\neq 0)$

Statement 2: $\lim_{x\to 2}\left(\frac{\frac{1}{x}+\frac{1}{2}}{x+2}\right)=\frac{1}{4}$ **KCET 2021 - (Average)**

A) Only Statement 2 is true B) Only Statement 1 is true

C) Both Statements1and2 are true D) Both Statements 1 and 2 are false

80. If $f(x)=\begin{vmatrix}\sin x & \cos x & \tan x\\ x^3 & x^2 & x\\ 2x & 1 & x\end{vmatrix}$ **then** $\lim_{x\to 0}\frac{f(x)}{x^2}$ **is** **KCET 2012 - (Difficult)**

A)0 B)3 C)2 D)1

81. If $f(x)=\begin{vmatrix}\cos x & 1 & 0\\ 0 & 2\cos x & 3\\ 0 & 1 & 2\cos x\end{vmatrix}$ **then** $\lim_{x\to\pi} f(x)$ **is** **KCET 2021- (Average)**

A)0 B)3 C)-1 D)1

82. If $f(x)=x\sin x$ **then** $f^1\left(\frac{\pi}{2}\right)$ **is equal to** **(Easy)**

A)0 B)1 C)-1 D)$\frac{1}{2}$

83. If $y=\sqrt{x}+\frac{1}{\sqrt{x}}$**, then** $\frac{dy}{dx}$ **at** $x=1$ **is** **(Easy)**

A)1 B)$\frac{1}{\sqrt{2}}$ C)$\frac{1}{2}$ D) 0

84. If $f(x)=\frac{x-4}{2\sqrt{x}}$ **then** $f^1(1)$ **is** **(Easy)**

A)$\frac{5}{4}$ B)$\frac{4}{5}$ C) 1 D) 0

85. If $y=\frac{1+\frac{1}{x^2}}{1-\frac{1}{x^2}}$ **then** $\frac{dy}{dx}$ **is** **(Easy)**

A) $\frac{-4x}{(x^2-1)^2}$ B) $\frac{-4x}{(x^2-1)}$ C) $\frac{1-x^2}{4x}$ D) $\frac{4x}{(x^2-1)}$

86. If $y=\frac{\sin x+\cos x}{\sin x-\cos x}$**, then** $\frac{dy}{dx}$ **at** $x=0$ **is** **(Easy)**

A)-2 B)0 C)$\frac{1}{2}$ D) *Doesn't exist*

87. **If** $y=\frac{\sin(x+9)}{\cos x}$ **, then** $\frac{dy}{dx}$ **at** $x=0$ **is** (Easy)

A) $\cos 9$ B) $\sin 9$ C) 0 D) 1

88. **If** $f(x)=1+x+\frac{x^2}{2}+\_\_\_\_\_\_+\frac{x^{100}}{100}$, **then** $f^{'}(1)$ **is equal to** (Easy)

A) $\frac{1}{100}$ B) 100 C) 0 D) $Doesn't\,exist$

89. **If** $f(x)=x^{100}+x^{99}+\_\_\_\_\_\_+x+1$, **then** $f^{'}(1)$ **is equal to** (Easy)

A) 5050 B) 5049 C) 5051 D) 50051

90. **If** $f(x)=1-x+x^2-x^3+x^4-\_\_\_\_\_\_\_-x^{99}+x^{100}$, **then** $f^{'}(1)$ **is equal to** (Average)

A) 150 B) -50 C) -150 D) 50

THINK & DISCUSS MCQS									
1	2	3	4	5	6	7	8	9	10
A	C	C	D	D	C	D	A	C	D
11	12	13	14	15	16	17	18	19	20
B	C	A	C	C	A	B	C	C	A
21	22	23	24	25	26	27	28	29	30
B	C	D	A	C	A	C	D	A	B
31	32	33	34	35	36	37	38	39	40
C	D	D	D	B	C	A	B	C	D
41	42	43	44	45	46	47	48	49	50
D	A	C	D	B	C	C	C	C	A
51	52	53	54	55	56	57	58	59	60
A	D	D	D	B	B	B	C	C	C
61	62	63	64	65	66	67	68	69	70
C	B	C	C	C	D	D	A	B	A
71	72	73	74	75	76	77	78	79	80
B	C	A	B	D	D	D	D	D	B
81	82	83	84	85	86	87	88	89	90
C	B	D	A	A	A	A	B	A	D