18. LIMITS

1. $\lim_{x\to\infty}\left(\frac{2x^2+3x+4}{x^2-3x+5}\right)^{\frac{3|x|+1}{2|x|-1}}=$

[AP EAMCET 17-09-20_Shift-1]

1. $\frac{3}{2}$ 2. $2\sqrt{2}$
3. 3 4. $\sqrt{2}$

2. If a>0, $n\in R$ then $\lim_{x\to a}x^n=$

[AP EAMCET 17-09-20_Shift-1]

1. na^n 2. $(n-1)a^n$
3. na^{n-1} 4. a^n

3. $\lim_{x\to 0}\frac{8}{\sin^8 x}\left\{1-\cos\left(\frac{x^2}{2}\right)-\cos\left(\frac{x^2}{4}\right)+\cos\left(\frac{x^2}{2}\right)\cos\left(\frac{x^2}{4}\right)\right\}=$

[AP EAMCET 17-09-20_Shift-1]

1. $\frac{1}{16}$ 2. $\frac{1}{32}$
3. $\frac{1}{64}$ 4. $\frac{1}{8}$

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

[AP EAMCET 17-09-20_Shift-2]

1. $\frac{3}{\sqrt{2}}$ 2. $\frac{-1}{\sqrt{2}}$
3. $\frac{1}{\sqrt{2}}$ 4. $\frac{5}{\sqrt{2}}$

5. If $\lim_{x\to\infty}\left(1+\frac{p}{x}\right)^{qx}=e^9$ where $p,q\in N$ then $p+q=$

[AP EAMCET 17-09-20_Shift-2]

1. 6 2. 9
3. 81 4. 18

6. $\lim_{x\to 0}(1+3x)^{2/x}=$

[AP EAMCET 18-09-20_Shift-1]

1. 6 2. e^6
3. e^{-6} 4. $e^{1/6}$

7. $\lim_{n\to\infty}\frac{n!}{(n+1)!-n!}=$

[AP EAMCET 18-09-20_Shift-1]

1. 1 2. -1
3. 2 4. 0

8. $\lim_{x\to 0}\frac{a^x-1}{\sin(x)}=$ **[AP EAMCET 21-09-20_Shift-1]**

1. log(a) 2. $\frac{1}{2}\log(a)$
3. 0 4. 1

9. $\lim_{n\to\infty}\frac{2^2+4^2+6^2+\ldots\ldots+(2n)^2}{n^3}=$

[AP EAMCET 21-09-20_Shift-1]

1. $\frac{2}{3}$ 2. $\frac{4}{3}$
3. $\frac{3}{2}$ 4. $\frac{8}{7}$

10. $\lim_{x\to 1}\left((1-x)\tan\left(\frac{\pi x}{2}\right)\right)=$

[AP EAMCET 21-09-20_Shift-2]

1. $\frac{1}{\pi}$ 2. $\frac{3}{\pi}$
3. $\frac{4}{\pi}$ 4. $\frac{2}{\pi}$

11. Find the value of $\lim_{x\to 0}\frac{\sin(x^m)}{(\sin x)^n}$,given that n<m

[AP EAMCET 21-09-20_Shift-2]

1. 2 2. 1
3. 0 4. ∞

12. If $\lim_{x\to 3}\left(\frac{x^n-3^n}{x-3}\right)=108$ and $n\in N$ then the value of 'n' is **[AP EAMCET 22-09-20_Shift-2]**

1. 3 2. 6
3. 5 4. 4

13. $\lim_{x\to 0}\frac{\left(1+\frac{x}{2}\right)^{\frac{5}{7}}-1}{x}$

[AP EAMCET 22-09-20_Shift-2]

1. $\frac{5}{7}$ 2. $\frac{10}{7}$
3. $\frac{5}{14}$ 4. $\frac{5}{17}$

14. $\lim_{x\to\infty}(1+\frac{2}{x})^{3x} =$

[AP EAMCET 23-09-20_Shift-1]

1. e^6
2. e^3
3. e^2
4. e

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

1. 0
2. -1
3. $\frac{1}{2}$
4. 1

16. $\lim_{n\to\infty}\left\{n-\sqrt{n^2-4n}\right\} =$

1. 0
2. 2
3. 4
4. 1

17. $f : R^+ \to R$ be an increasing function such that $f(x) > 0$ for all x, if $\lim_{x\to\infty}\frac{f(9x)}{f(3x)} = 1$, then $\lim_{x\to\infty}\frac{f(6x)}{f(3x)} =$

[TS EAMCET 09-09-20_Shift-1]

1. 1
2. 2
3. $\frac{3}{2}$
4. $\frac{2}{3}$

18. $\lim_{x\to 0}\frac{x^4+x^3+x^2}{\sin^{-1}\left(\frac{x}{\sqrt{1+x^2}}\right).\tan^{-1}x} =$

[TS EAMCET 09-09-20 Shift-2]

1. $\frac{1}{\sqrt{2}}$
2. 0
3. 1
4. $\frac{-1}{\sqrt{2}}$

19. If $\log(1+x) = x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}+....\infty$ and $\lim_{x\to 0}\frac{\log(1+x)^{(1+x)}}{x^2}-\frac{1}{x} = k$, Then $12k =$

[TS EAMCET 10-09-20_Shift-1]

1. 1
2. 3
3. 6
4. 9

20. $\lim_{x\to 0}\frac{1-\cos\left(x^2+\pi(x+2)\right)}{x^2} =$

[TS EAMCET 10-09-20_Shift-2]

1. $\frac{\pi}{2}$
2. $\frac{\pi^2}{4}$
3. $\frac{\pi^2}{2}$
4. $\frac{\pi}{4}$

21. $Lim_{x\to 0}\frac{1-\cos(1-\cos x)}{\sin^4 x} =$

[TS EAMCET 11-09-20_Shift-2]

1. 1/2
2. 1/4
3. 1/6
4. 1/8

22. $\lim_{z\to 1}\frac{z^{\frac{1}{3}}-1}{z^{\frac{1}{6}}-1} =$ **[AP EAMCET 19-08-2021_Shift-1]**

1. -1
2. 1
3. 2
4. -2

23. $\lim_{n\to\infty}\frac{n(2n+1)^2}{(n+2)(n^2+3n-1)} =$

[AP EAMCET 20-08-2021_Shift-1]

1. 0
2. 4
3. 2
4. ∞

24. If $\lim_{x\to\infty}\left(\frac{11x^3-3x+4}{13x^3-5x^2-7}\right) = \frac{a}{b}$ then the value of a+b equals

[AP EAMCET 20-08-2021_Shift-2]

1. 11
2. 13
3. 8
4. 24

25. $\lim_{x\to 1}\frac{(1-x)(1-x^2).....(1-x^{2n})}{\left\{(1-x)(1-x^2)......(1-x^n)\right\}^2} =$ __, $\forall$ n $\in$ N

[AP EAMCET 20-08-2021_Shift-2]

1. ${}^{2n}P_n$
2. ${}^{2n}C_n$
3. $(2n)!$
4. $\frac{(2n)!}{n!}$

26. The limit $\lim_{x\to 1}\frac{\sqrt{1-\cos 2(x-1)}}{x-1}$ ____

[AP EAMCET 23-08-2021_Shift-1]

1. exists and is equal to $\sqrt{2}$
2. exists and is equal to - $\sqrt{2}$
3. does not exist
4. exists and is equal to (1/2)

27 $\lim_{x\to 0}\left(\frac{\sin ax}{\tan bx}\right) =$ **[AP EAMCET 25-08-2021_Shift-1]**

1. ab
2. $\frac{a}{b}$
3. $\frac{b}{a}$
4. 1

28. $\lim\limits_{x\to 0}\dfrac{\tan(x)+4\tan(2x)-3\tan(3x)}{x^2\tan(x)}=$

[AP EAMCET 23-08-2021_Shift-2]

1. 8
2. −8
3. 16
4. −16

29. $\lim\limits_{x\to 0}\dfrac{8}{x^8}\left(1-\cos\left(\dfrac{x^2}{2}\right)-\cos\left(\dfrac{x^2}{4}\right)+\cos\left(\dfrac{x^2}{2}\right).\cos\left(\dfrac{x^2}{4}\right)\right)=$

[AP EAMCET 23-08-2021_Shift-2]

1. $\dfrac{1}{4}$
2. $\dfrac{1}{8}$
3. $\dfrac{1}{16}$
4. $\dfrac{1}{32}$

30. If $\lim\limits_{n\to\infty}\dfrac{1-(10)^n}{1+(10)^{n+1}}=\dfrac{-\alpha}{10}$, then $\alpha=$ _____

[AP EAMCET 24-08-2021_Shift-1]

1. 0
2. −1
3. 1
4. 2

31. $\lim\limits_{x\to\infty}\left(\dfrac{x+6}{x+1}\right)^{x+4}=$

[AP EAMCET 24-08-2021_Shift-1]

1. e^4
2. e^6
3. e^5
4. e

32. $\lim\limits_{x\to 0^+}\dfrac{x\sin^{-1}\left(\dfrac{2x}{1+x^2}\right)}{\cos^{-1}\left(\dfrac{1-x^2}{1+x^2}\right)\tan^{-1}\left(\dfrac{3x-x^3}{1-3x^2}\right)}=$

[AP EAMCET 24-08-2021_Shift-1]

1. $\dfrac{1}{2}$
2. $\dfrac{1}{3}$
3. $\dfrac{1}{4}$
4. $\dfrac{1}{6}$

33. $\lim\limits_{x\to(-3)}\left(\dfrac{\sin^{-1}(x+3)}{x^2+3x}\right)=$

[AP EAMCET 25-08-2021_Shift-1]

1. 0
2. ∞
3. −3
4. $\dfrac{-1}{3}$

34. $\lim\limits_{x\to\infty}\left(\dfrac{2+\sin x}{x^2+3}\right)=$

[AP EAMCET 25-08-2021_Shift-2]

1. 0
2. 1
3. −1
4. ∞

35. If [.] here denotes the greatest integer function, $\lim\limits_{x\to 0}x^7\left[\dfrac{1}{x^3}\right]=$

[AP EAMCET 25-08-2021_Shift-2]

1. 1
2. 0
3. −1
4. Does not exist

36. If $\lim\limits_{x\to 0}\left\{1+x\log\left(1+a^2\right)\right\}^{1/x}=2a\sin^2\theta, a>0$ and $\theta\in R$, then ______

[AP EAMCET 25-08-2021_Shift-2]

1. $\theta=n\pi\pm\dfrac{\pi}{2},(n\in Z)$
2. $\theta=2n\pi\pm\dfrac{\pi}{2},(n\in Z)$
3. $\theta=n\pi+\dfrac{\pi}{2},(n\in Z)$
4. $\theta=n\pi\pm\dfrac{\pi}{4},(n\in Z)$

37. $\lim\limits_{x\to 0}\dfrac{x^2 2^x-x^2\sin x-x^2}{3^x+\cos x-3^x\cos x-1}=$

[TS EAMCET 04-08-2021_Shift-2]

1. $\dfrac{1}{\log 3}(\log 2-1)$
2. $\dfrac{4}{\log 3}(1-\log 2)$
3. $\dfrac{4}{\log 3}(\log 2-1)$
4. $\dfrac{2}{\log 3}(\log 2-1)$

38. If $\lim\limits_{x\to 2}\dfrac{3x^2-ax+5b}{x-2}=17$, then $ab=$

[TS EAMCET 04-08-2021_Shift-2]

1. -34
2. -25
3. -22
4. 22

39. $\lim\limits_{x\to 0}\dfrac{(1-\cos 2x)}{x\tan 2x+\dfrac{2x}{3}\tan 3x}=$

[TS EAMCET 04-08-2021_Shift-2]

1. -6
2. $\dfrac{1}{2}$
3. 0
4. $\dfrac{-6}{5}$

40. If $f(x)=\tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right)$ then

$\lim_{x\to\frac{1}{2}}\frac{2\left[f(x)-f\left(\frac{1}{2}\right)\right]}{2x-1}=$

[TS EAMCET 04-08-2021_Shift-2]

1. $\frac{1}{\sqrt{2}}$
2. $\frac{\sqrt{3}}{2}$
3. $\frac{\sqrt{2}}{\sqrt{3}}$
4. $\frac{1}{\sqrt{3}}$

41. $\lim_{x\to1}\frac{\log x}{(1-x)}=$

[TS EAMCET 04-08-2021_Shift-1]

1. 1
2. -1
3. 0
4. $\frac{-1}{2}$

42. If $f(x)=\begin{cases}\frac{\sin[x]}{[x]}, & [x]\neq0\\ 0, & [x]=0\end{cases}$, where $[x]$ denotes the greatest integer less than or equal to x, then $\lim_{x\to0^-}f(x)$

[TS EAMCET 05-08-2021_Shift-1]

1. Exist and equal to 1
2. Exist and equal to $\sin1$
3. Exist and equal to $-\sin1$
4. Does not exist

43. $\lim_{x\to-\infty}\frac{3|x|^3-x^2+2|x|-5}{-5|x|^3+3x^2-2|x|+7}=$

[TS EAMCET 05-08-2021_Shift-1]

1. $\frac{3}{5}$
2. $\frac{-5}{7}$
3. $\frac{5}{7}$
4. $\frac{-3}{5}$

44. If $f(x)=-\left(\sin^2x+\cos^5x\right)$, then $\lim_{x\to0}\frac{1}{x}f'(x)$

[TS EAMCET 05-08-2021_Shift-2]

1. Exist and is equal to 0
2. Exist and is equal to 7
3. Exist and is equal to 3
4. Does not exist

45. $\lim_{n\to\infty}P\left(1+\frac{r}{100n}\right)^{tn}=$

[TS EAMCET 05-08-2021_Shift-2]

1. P
2. $P\left(1+\frac{r}{100}\right)^t$
3. $Pe^{\frac{rt}{100}}$
4. $Pe^{\frac{r}{100}}$

46. If a,b are roots of the equation $px^2+qx+r=0$, then

$\lim_{x\to b}\frac{1-\cos2\left(px^2+qx+r\right)}{2(px-pb)^2}=$

[TS EAMCET 06-08-2021_Shift-2]

1. $\frac{1}{2}(b-a)^2$
2. $(a+b)^2$
3. $\frac{1}{2}$
4. $a^2-2ab+b^2$

47. If $f:R\to R$ defined as

$f(x)=\frac{x^3+2x^2+x+2}{x^2+x-2}$ (when $x\neq-2$) is continuous at $x=-2$, then $f(-2)=$

[TS EAMCET 06-08-2021_Shift-2]

1. 5
2. $\frac{-5}{3}$
3. 2
4. $\frac{3}{5}$

48. $\lim_{x\to0^-}\frac{\sqrt{\frac{1}{2}\left(1-\cos^2x\right)}}{x}=$

[TS EAMCET 06-08-2021_Shift-1]

1. $\frac{1}{\sqrt{2}}$
2. $\frac{-1}{\sqrt{2}}$
3. -1
4. Does not exist

49. $\lim_{x\to0}\frac{2\sin x-\sin2x}{x^3}=$

[TS EAMCET 06-08-2021_Shift-1]

1. 1
2. 0
3. -1
4. Does not exist

50. Let $f: R^{+} \rightarrow R^{+}$ be a function satisfying $f(x)-x=\lambda(\text{constant}), \forall x \in R^{+}$ and $f(xf(y))=f(xy)+x, \forall x, y, \in R^{+}$.

Then $\lim_{x\to 0}\frac{(f(x))^{1/3}-1}{(f(x))^{1/2}-1}=$

[AP EAMCET 04-07-2022_Shift-1]

1. $1/3$
2. 0
3. $2/3$
4. 1

51. If $\lim_{x\to 0}\frac{|x|}{\sqrt{x^4+4x^2+5}}=k$, $\lim_{x\to 0} x^4 \sin\left(\frac{1}{3\sqrt{x}}\right)=l$, Then $k+l=$

[AP EAMCET 04-07-2022_Shift-1]

1. 0
2. 1
3. -1
4. 5

52. If $\lim_{n\to\infty} x^n \log_e x = 0$, then $\log_x 12 =$

[AP EAMCET 04-07-2022_Shift-1]

1. Negative
2. Positive
3. Zero
4. Any value between -1 and 1

53. If $[.]$ denotes greatest integer function, then $\lim_{x\to\frac{-3}{5}}\frac{1}{x}\left[\frac{-1}{x}\right]=$

[AP EAMCET 04-07-2022_Shift-2]

1. $-5/3$
2. $5/3$
3. $10/3$
4. $-10/3$

54. If l,m (l<m) are roots of $ax^2+bx+c=0$, then $\lim_{x\to\alpha}\frac{|ax^2+bx+c|}{ax^2+bx+c}=$

[AP EAMCET 04-07-2022_Shift-2]

1. $\frac{|a|}{a}, \forall \alpha \in R$
2. $\frac{-|a|}{a}$, when $\alpha \notin (l,m)$
3. $\frac{-|a|}{a}$, when $\alpha \in (l,m)$
4. $\frac{|a|}{a}, \alpha \in (l,m)$

55. Let f(x)= $\begin{cases} \frac{1}{|x|}, \text{for } |x|>1 \\ ax^2+b, \text{for } |x|\le 1 \end{cases}$ If $\lim_{x\to 1} f(x)$ and $\lim_{x\to -1} f(x)$ exist, then the possible values for a and b are **[AP EAMCET 04-07-2022_Shift-2]**

1. a=b=1
2. a= -1/2,b= -3/2
3. a=3/2, b= -1/2
4. a=1/2 ,b=-3/2

56. $\lim_{x\to-\infty} \log_e(\cosh x)+x=$

[AP EAMCET 05-07-2022_Shift-1]

1. Log 2
2. $-$log2
3. $\log\left(1/2\right)+2$
4. $\log\left(1/2\right)-2$

57. If a, b, c are three distinct real numbers and $\lim_{x\to\infty}\frac{(b-c)x^2+(c-a)x+(a-b)}{(a-b)x^2+(b-c)x+(c-a)}=\frac{1}{2}$ then $a+2c=$

[AP EAMCET 05-07-2022_Shift-1]

1. b
2. 2b
3. 3b
4. 4b

58. $\lim_{x\to-\infty}\frac{3|x|-x}{|x|-2x}-\lim_{x\to 0}\frac{\log(1+x^3)}{\sin^3 x}=$

[AP EAMCET 05-07-2022_Shift-1]

1. $1/3$
2. $-1/4$
3. 2
4. $-5/3$

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

[AP EAMCET 05-07-2022_Shift-2]

1. $2+\sqrt{2}$
2. $2-\sqrt{2}$
3. 1
4. $\sqrt{2}$

60. If $a>0$, [.] denotes greatest integer function and $\lim_{x\to a^-}\left(\frac{|x|^3}{a}-\left[\frac{x}{a}\right]^3\right)=k$, $\lim_{x\to a^+}\left(\frac{|x|^3}{a}-\left[\frac{x}{a}\right]^3\right)=l$ then **[AP EAMCET 05-07-2022_Shift-2]**

1. $k=l$
2. $k-l=1$
3. $l-k=1$
4. $l=a^2$, k does not exist

61. $\lim_{n\to\infty}\frac{A+e^{nx}}{x+Ae^{nx}}=$

[AP EAMCET 05-07-2022_Shift-2]

1. A/x, *when* $x<0$
2. 1, when $x>0$
3. 0, when $\forall\ x\in R$
4. A, *when* $x=0$

62. $\lim_{n\to\infty}\sum_{r=1}^{n}\frac{r+2}{r(r+1)(r+3)}=$

[AP EAMCET 06-07-2022_Shift-1]

1. $\frac{29}{36}$
2. $\frac{1}{36}$
3. $\frac{5}{36}$
4. $\frac{23}{36}$

63. If $a>0, b>0$ *then* $\lim_{n\to\infty}\left(\frac{a+b^{1/n}-1}{a}\right)^n=$

[AP EAMCET 06-07-2022_Shift-1]

1. a^b
2. b^a
3. $b^{1/a}$
4. $a^{1/b}$

64. $\lim_{x\to\frac{\pi}{6}}\frac{3\sin x-\sqrt{3}\cos x}{6x-\pi}$

[AP EAMCET 06-07-2022_Shift-1]

1. $\frac{-1}{\sqrt{3}}$
2. $\frac{1}{\sqrt{3}}$
3. $1/\sqrt{2}$
4. $-1/\sqrt{2}$

65. $\lim_{n\to\infty}\sum_{r=1}^{n}\cot^{-1}\left(r^2+\frac{3}{4}\right)=$

[AP EAMCET 06-07-2022_Shift-2]

1. $\text{Cot}^{-1}2$
2. $\text{Cot}^{-1}\frac{1}{3}$
3. $\tan^{-1}2$
4. $\tan^{-1}\frac{1}{3}$

66. If n > 0 and $\lim_{x\to 0}\frac{((a-n)nx-\tan x)\sin nx}{x^2}=0$, then minimum value of a is

[AP EAMCET 06-07-2022_Shift-2]

1. 1
2. 2
3. 3
4. -1

67. $\lim_{x\to 0}\left(\frac{e^x-1}{x}\right)^{\frac{x}{x+1-e^x}}=$

[AP EAMCET 06-07-2022_Shift-2]

1. e
2. e^{-1}
3. e^2
4. e^{-2}

68. If $\lim_{x\to 0^+}x^2\left(\frac{e^{\frac{1}{x}}-e^{-\frac{1}{x}}}{e^{\frac{1}{x}}+e^{\frac{-1}{x}}}\right)=k$ and $\lim_{x\to 0^-}x^2\left(\frac{e^{\frac{1}{x}}-e^{\frac{-1}{x}}}{e^{\frac{1}{x}}+e^{\frac{-1}{x}}}\right)=l$, then

[AP EAMCET 07-07-2022_Shift-1]

1. k=l
2. k=1,l=-1
3. k=-1,l=1
4. k≠l≠ ± 1

69. If $f(x)=\frac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}+1}$, *then*

[AP EAMCET 07-07-2022_Shift-1]

1. $\lim_{x\to 0}f(x)=0$
2. $\lim_{x\to\infty}f(x)=1$
3. $\lim_{x\to 0}f(x)=-1$
4. $\lim_{x\to\infty}f(x)=0$

70. $\lim_{x\to 0}\frac{\sqrt{11+|x|-6\sqrt{2+|x|}}}{6-2\sqrt{2+|x|}}=$

[AP EAMCET 07-07-2022_Shift-1]

1. -1
2. $-\frac{1}{2}$
3. $\frac{\sqrt{11-6\sqrt{2}}}{3-\sqrt{2}}$
4. $\frac{1}{2}$

71. $\lim_{x\to 0}x^3\left\{\sqrt{x^2+\sqrt{x^4+1}}-\sqrt{2}x\right\}=$

[AP EAMCET 07-07-2022_Shift-2]

1. $\sqrt{2}$
2. $\frac{1}{2\sqrt{2}}$
3. $\frac{1}{4\sqrt{2}}$
4. $\frac{1}{\sqrt{2}}$

72. $\lim_{x\to -a}\frac{x^7+a^7}{x+a}=7\Rightarrow a=$

[AP EAMCET 07-07-2022_Shift-2]

1. ±7
2. ±6
3. ±1
4. ±2

73. $\lim_{x\to\frac{\pi}{2}} \frac{1-\tan\frac{x}{2}}{1+\tan\frac{x}{2}} \cdot \frac{1-\sin x}{(\pi-2x)^3} =$

[AP EAMCET 07-07-2022_Shift-2]

1. $\frac{1}{32}$
2. 0
3. $\frac{1}{16}$
4. $\frac{1}{8}$

74. If $\lim_{n\to\infty} x_n$ exists and is finite,

$x_1 = 2, x_{n+1} = \frac{a+bx_n}{b+cx_n} \forall n \in N$ and c > b > a > 0

then $\lim_{n\to\infty} x_n =$

[AP EAMCET 08-07-2022_Shift-1]

1. $\sqrt{ab/c}$
2. $\sqrt{a/c}$
3. $\sqrt{c/b}$
4. $\sqrt{a/b}$

75. The integral value of n for which

$\lim_{x\to 0} \frac{(\cos x - 1)(\cos x - e^x)}{x^n}$ is a finite non zero real number is

[AP EAMCET 08-07-2022_Shift-1]

1. 4
2. 3
3. 2
4. 1

76. $\lim_{x\to 0} \frac{x^2 \log(\cos x)}{\log(1+x^2)} =$

[AP EAMCET 08-07-2022_Shift-1]

1. 0
2. 1
3. -1
4. ∞

77. If [.] denotes greatest integer function, then

$\lim_{x\to\frac{\pi^+}{2}} \frac{[\sin x]-[\cos x]+1}{2} =$

[AP EAMCET 08-07-2022_Shift-2]

1. 0
2. $\frac{-1}{2}$
3. $\frac{1}{2}$
4. 1

78. If $A \neq 0$ *and* $x > 0$, *then* $\lim_{n\to\infty} \frac{\cos x - e^{nx}}{1 - Ae^{nx}} =$

[AP EAMCET 08-07-2022_Shift-2]

1. Does not exist
2. 1
3. $\frac{\cos x}{A}$
4. $\frac{1}{A}$

79. Let $f(x) = \lim_{y\to\infty} y\left(x^{\frac{1}{y}} - 1\right)$ and

$2022 f\left(\frac{1}{x}\right) + P f(x) = f(x^2)$, then P=

[AP EAMCET 08-07-2022_Shift-2]

1. 2020
2. 2021
3. 2023
4. 2024

80. $\lim_{x\to 3^-} \frac{x^3-3x^2-4x+12}{2x^3-7x^2+2x+3} =$

[TS EAMCET 18-07-2022_Shift-1]

1. 0
2. ∞
3. $\frac{5}{14}$
4. $\frac{6}{13}$

81. $\lim_{x\to 0} \frac{2^{2x}-2^{x+1}+2-\cos 2x}{x^2} =$

[TS EAMCET 18-07-2022_Shift-1]

1. $2+\log 2$
2. $2+(\log 2)^2$
3. $2+(\log 4)^2$
4. $2+\log 4$

82. $\lim_{x\to 0} \frac{\tan^2(\pi \sec^4 x)}{\pi^2 x^4} =$

[TS EAMCET 19-07-2022_Shift-I]

1. 0
2. 4
3. 1
4. 16

83. $\lim_{x\to 0}\left(\frac{4!}{x^8}\left(1-\cos\frac{x^2}{3}-\cos\frac{x^2}{4}+\cos\frac{x^2}{3}\cos\frac{x^2}{4}\right)\right) =$

[TS EAMCET 19-07-2022_Shift-I]

1. 8
2. $\frac{1}{6}$
3. $\frac{1}{24}$
4. $\frac{2}{3}$

84. Let $f(x)=\sin x, g(x)=\cos x, h(x)=x^2$ then $\lim_{x\to 1}\frac{f(g(h(x)))-f(g(h(1)))}{x-1}=$

[TS EAMCET 19-07-2022_Shift-I]

1. 0
2. $-2\sin 1\cos(\cos 1)$
3. ∞
4. $-2\sin 1\cos 1$

85. $\lim_{x\to 2}\left[(x^2-4x+4)\cos\left(\frac{2}{x-2}\right)+\frac{x^2-4}{x^3-2x-4}\right]=$

[TS EAMCET 19-07-2022_Shift-2]

1. 0
2. ∞
3. 1
4. $\frac{2}{5}$

86. $\lim_{x\to 0}\frac{\tan 2x-2\tan x}{(1-\cos x)(2^x-1)}=$

[TS EAMCET 19-07-2022_Shift-2]

1. $\frac{2}{\log 2}$
2. $\frac{1}{\log 4}$
3. $4\log 2$
4. $\frac{4}{\log 2}$

87. Let $A=(a_{ij})$ be an $n\times n$ matrix defined by $a_{ij}=\begin{cases}k^i, & \forall i=j\\ 0, & otherwise\end{cases}$. If m = trace of A and $\lim_{k\to 1}\frac{n-m}{1-k}=171$ then the value of n is

[TS EAMCET 18-07-2022_Shift-2]

1. 18
2. 23
3. 35
4. 42

88. $\lim_{x\to\infty}x^3\left[\sqrt{x^2+\sqrt{x^4+1}}-\sqrt{2}x\right]=$

[TS EAMCET 18-07-2022_Shift-2]

1. 0
2. 1
3. $\frac{1}{4\sqrt{2}}$
4. $\frac{3}{2\sqrt{2}}$

89. Let [x] denote the greatest integer less than or equal to x and f(x) = 2x−[2x]. If $\lim_{x\to 2^-}f(x)=l_1$ *and* $\lim_{x\to 2^+}f(x)=l_2$ *then* $l_1+l_2=$

[TS EAMCET 20-07-2022_Shift-1]

1. 1
2. 2
3. 0
4. 4

90. $\lim_{x\to 0}\frac{(2^x-1)(1+\sin x)^{\frac{2}{\sin x}}}{\log(1+2x)}=$

[TS EAMCET 20-07-2022_Shift-1]

1. $e^2\log 4$
2. $e\log\sqrt{2}$
3. $e^2\log 2$
4. $e^2\log\sqrt{2}$

91. $\lim_{x\to 2}\frac{x^3-x^2-x-2}{2x^3-3x^2-3x+2}=$

[TS EAMCET 20-07-2022_Shift-2]

1. 0
2. ∞
3. $\frac{5}{7}$
4. $\frac{7}{9}$

92. $\lim_{x\to 0}\frac{4[\sin(2022x)-\sin(2020x)]}{x[\cos(2022x)+2\cos(2021x)+\cos(2020x)]}=$

[TS EAMCET 20-07-2022_Shift-2]

1. 1
2. 2
3. 2020
4. 2021

93. *Let* $f(x)=|x-3|+|x+5|$ *and* $A=\left\{a\in R/\lim_{x\to a}\frac{f(x)-f(a)}{x-a}\ exists\right\}$.

Then the number of real numbers which are in $(-\infty,-3)\cup(5,\infty)$ but not in A is

[16th May 2023 Shift 1]

1. 2
2. 0
3. 1
4. 3

94. $\lim_{x\to 1}\left(\lim_{y\to\infty}y(ex)^{1/y}-1\right)=$

[16th May 2023 Shift 1]

1. e
2. 0
3. 1
4. -1

95. Assertion (A): $\lim_{x\to 0}\frac{1}{x}=\infty$

Reason (R) : As the value of x decreases, the value of $\frac{1}{x}$ increases

[16th May 2023 Shift 2]

1.Both A,R are true, and R is correct explanation of A
2.A,R are both true and R is not correct explanation of A
3.A is true and R is false
4.A is false and R is true

96. If $f(x)=\begin{vmatrix} 1 & 6+x & 36+x^2 \\ 0 & x-3 & 3x^2-27 \\ 0 & 2x-4 & 8x^2-32 \end{vmatrix}$,

then $\lim\limits_{x\to 1}\dfrac{f(x)}{f(-x)}=$ **[17th May 2023 Shift 1]**

1. 2
2. -1
3. 0
4. 1

97. f(x) is differentiable on R and $f'(m)\neq 0, m\in R$.

If $\lim\limits_{x\to m}\dfrac{x f(m)-m f(x)}{x-m}+f'(m)=f(m)$, then m =

[17th May 2023 Shift 1]

1. 0
2. -1
3. 1
4. 2

98. If $\lim\limits_{x\to 2}\dfrac{1+\sqrt{1+4\log_2 x}}{2+(2x+\sin^2 x+2\cos x)(2x-4)}=$ m,

then m(m–1) = **[17th May 2023 Shift 2]**

1. 0
2. $\log_2 e$
3. 1
4. $\dfrac{1+\sqrt{3}}{2}$

99. If f(x)= $\dfrac{1-x+\sqrt{9x^2+10x+1}}{2x}$,then $\lim\limits_{x\to -1^-}$ f(x)=

[18th May2023 shift -1]

1. 1
2. -1
3. 0
4. -1/5

100. $\lim\limits_{x\to -9}\dfrac{(2.5)^{81-x^2}-(0.4)^{x+9}}{x+9}=$

[18th May 2023 Shift 2]

1. 18 log(2.5)+log(0.4)
2. log(2.5) – log (0.4)
3. 18(log(2.5)+log(0.4))
4. -19 log (0.4)

101. Let $S_n=1+3x+9x^2+27x^3$….n terms and $-\dfrac{1}{3}<x<\dfrac{1}{3}$. If $\underset{n\to\infty}{Lt}\, S_n=f(x)$, then

[18th May 2023 Shift 2]

1. 0
2. $\dfrac{1}{3}$
3. 1
4. -1

102. Let[.] denote the greatest integer function.

Assertion (A): $\lim\limits_{x\to\infty}\dfrac{[x]}{x}=1$

Reason (R) : f(x) = x-1 , g(x) =[x], h(x) =x and $\lim\limits_{x\to\infty}\dfrac{f(x)}{x}=\lim\limits_{x\to\infty}\dfrac{h(x)}{x}=1$

[18th May 2023 Shift 2]

1. A is true, R is true; R is correct explanation of A
2. A, R are true; R is not the correct explanation of A
3. A is true, R is false
4. A is false, R is true

103. Let $f(x)=\sqrt{\dfrac{x}{1-x}}+\sqrt{\dfrac{1-x}{x}}$. If $\lim\limits_{x\to 1^-}f(x)=l$ And $\lim\limits_{x\to m}f(x)=5/2$, then the set of all possible finite values of l and m is

[19th May 2023 Shift 1]

1. $\{0,1\}$
2. $\left\{0,\dfrac{1}{3},\dfrac{2}{3}\right\}$
3. $\left\{0,\dfrac{2}{5},\dfrac{3}{5}\right\}$
4. $\left\{\dfrac{1}{5},\dfrac{4}{5}\right\}$

104. $\lim\limits_{x\to 1}\dfrac{(2x-3)\left(\sqrt{x}-1\right)}{2x^2+x-3}=$

[12TH MAY 2023 SHIFT-1]

1. $\dfrac{1}{10}$
2. $-\dfrac{1}{10}$
3. $\dfrac{2}{5}$
4. $-\dfrac{2}{5}$

105. If a, b, c and k are non-zero real numbers and $\lim\limits_{x\to\infty} x\left(a^{1/x}+b^{1/x}+c^{1/x}-3k^{1/x}\right)=0$, then $k=$

[12TH MAY 2023 SHIFT-1]

1. 0
2. $(abc)^{1/3}$
3. $(abc)^{-1/3}$
4. 1

106. $\underset{x\to 1}{Lt}(1-x)\tan\left(\dfrac{\pi}{2}x\right)=$

[12TH MAY 2023 SHIFT -2]

1. $\dfrac{\pi}{2}$
2. $\dfrac{2}{\pi}$
3. 1
4. 0

107. If $f(9)=9$ and $f'(9)=4$, then

$$\underset{x\to 9}{Lt}\frac{\sqrt{f(x)}-3}{\sqrt{x}-3}=$$

[12TH MAY 2023 SHIFT -2]

1. 3 2. 4
3. 6 4. 9

108. $\lim\limits_{x\to 2^+}([x]^2-[x]-2)+\lim\limits_{x\to 3^-}([x]^2-4[x]+3)=$

[13TH MAY 2023 SHIFT-1]

1. 39 2. 33
3. 28 4. 44

109. $$\lim_{x\to 0}\frac{(3^{2x}-\sqrt{x+1})\sin 5x}{1-\cos 4x}=$$

[13TH MAY 2023 SHIFT-1]

1. $\frac{3}{5}(\log 18-1)$ 2. $\frac{5}{16}\log\left(\frac{81}{e}\right)$
3. $\frac{4}{15}(\log 81-1)$ 4. $\frac{16}{5}\left[\log(27)-1\right]$

110. $$\lim_{n\to\infty}\frac{1}{n^3}\sum_{k=1}^{n}\left(k^2x\right)=$$

[EAPCET 14-05-23 SHIFT-1]

1. x 2. $\frac{x}{2}$
3. $\frac{x}{3}$ 4. $\frac{x}{4}$

111. The quadratic equation whose roots are

$l=\lim\limits_{\theta\to 0}\left(\frac{3\sin\theta-4\sin^3\theta}{\theta}\right)$ and

$m=\lim\limits_{\theta\to 0}\left(\frac{2\tan\theta}{\theta\left(1-\tan^2\theta\right)}\right)$ *is*

[EAPCET 14-05-23 SHIFT-1]

1. $x^2-5x+6=0$ 2. $x^2+5x+6=0$
3. $x^2-5x-6=0$ 4. $x^2+5x-6=0$

112. $$\lim_{x\to 2}\frac{\sqrt[3]{6+x}-\sqrt[3]{10-x}}{x-2}=$$

[EAPCET 13-05-23 SHIFT-2]

1. 1/8 2. ¼
3. ½ 4. 1/16

113. $$\lim_{x\to 0}\frac{\tan^4 x-\sin^4 x}{x^6}=$$

[EAPCET 13-05-23 SHIFT-2]

1. ½ 2. 5/2
3. 2 4. 4

KEY

1)	2	2)	4	3)	2	4)	3	5)	1
6)	2	7)	4	8)	1	9)	2	10)	4
11)	3	12)	4	13)	3	14)	1	15)	3
16)	2	17)	1	18)	3	19)	3	20)	3
21)	4	22)	3	23)	2	24)	4	25)	2
26)	3	27)	2	28)	4	29)	4	30)	3
31)	3	32)	2	33)	4	34)	1	35)	2
36)	1	37)	4	38)	4	39)	2	40)	4
41)	2	42)	2	43)	4	44)	3	45)	3
46)	4	47)	2	48)	2	49)	1	50)	3
51)	1	52)	1	53)	1	54)	3	55)	3
56)	2	57)	3	58)	1	59)	4	60)	2
61)	1	62)	1	63)	3	64)	2	65)	3
66)	2	67)	2	68)	1	69)	4	70)	4
71)	3	72)	3	73)	1	74)	2	75)	2
76)	1	77)	4	78)	4	79)	4	80)	3
81)	2	82)	2	83)	3	84)	4	85)	4
86)	4	87)	1	88)	3	89)	1	90)	4
91)	4	92)	2	93)	3	94)	3	95)	4
96)	3	97)	3	98)	3	99)	2	100)	4
101)	2	102)	1	103)	4	104)	2	105)	2
106)	2	107)	2	108)	1	109)	2	110)	3
111)	1	112)	2	113)	3				

SOLUTIONS

1. $$\lim_{x\to\infty}\left(\frac{2x^2+3x+4}{x^2-3x+5}\right)^{\frac{3x+1}{2x-1}}=(2)^{3/2}=2\sqrt{2}$$

2. $$\lim_{x\to a}x^n=a^n$$

3. $$\lim_{x\to 0}\frac{8}{\sin^8 x}\left\{\left(1-\cos\left(\frac{x^2}{2}\right)\right)\left(1-\cos\left(\frac{x^2}{4}\right)\right)\right\}$$

$$\lim_{x\to 0}\frac{8}{\sin^8 x}\left\{4\sin^2\left(\frac{x^2}{4}\right)\sin^2\left(\frac{x^2}{8}\right)\right\}$$

$$\lim_{x\to 0} 32\frac{x^8}{\sin^8 x}\left(\lim_{x\to 0}\left(\frac{\sin\left(\frac{x^2}{4}\right)}{\frac{x^2}{4}}\right)^2\frac{1}{16}\right)\left(\lim_{x\to 0}\left(\frac{\sin\left(\frac{x^2}{8}\right)}{\frac{x^2}{8}}\right)^2\frac{1}{64}\right)$$

$$=32.\frac{1}{16}.\frac{1}{64}=\frac{1}{32}$$

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

$$Now\ \frac{1-\sin\frac{x}{2}}{\cos\frac{x}{2}\left(\cos\frac{x}{4}-\sin\frac{x}{4}\right)}$$

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

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

$$=\frac{1}{\left(\cos\frac{x}{4}+\sin\frac{x}{4}\right)}$$

$$\therefore \lim_{x\to\pi}\frac{1-\sin\frac{x}{2}}{\left(\cos\frac{x}{2}\right)\left(\cos\frac{x}{4}-\sin\frac{x}{4}\right)}$$

$$=\lim_{x\to\pi}\frac{1}{\left(\cos\frac{x}{4}+\sin\frac{x}{4}\right)}=\frac{1}{\frac{1}{\sqrt{2}}+\frac{1}{\sqrt{2}}}=\frac{1}{\sqrt{2}}$$

5. $$\lim_{x\to\infty}\left(1+\frac{p}{x}\right)^{qx}=e^9$$

$$\Rightarrow \lim_{x\to\infty}\left[\left(1+\frac{p}{x}\right)^{\frac{x}{p}}\right]^{pq}=e^9$$

$$\Rightarrow e^{pq}=e^9$$

$\Rightarrow pq=9$ *is possible for* $p=3, q=3$

$\therefore p+q=6$

6. $$\underset{x\to 0}{Lt}\,(1+3x)^{2/x}=1^\infty$$

$$\underset{x\to 0}{Lt}\,(1+3x)^{2/x}=e^{\underset{x\to 0}{Lt}\frac{2}{x}(1+3x-1)}$$

$$=e^{\underset{x\to 0}{Lt}\frac{2}{x}(3x)}=e^6$$

7. $$\lim_{n\to\infty}\frac{n!}{n!\left[\frac{(n+1)!}{n!}-1\right]}=\lim_{n\to\infty}\frac{1}{n+1-1}$$

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

8. $$\lim_{x\to 0}\frac{a^x-1}{x}.\frac{x}{\sin x}=\log a.(1)=\log a$$

9. $$\lim_{n\to\infty}\frac{2^2+4^2+6^2+.......+(2n)^2}{n^3}=\lim_{n\to\infty}\frac{2^2\left(1^2+2^2+.......+(n)^2\right)}{n^3}$$

$$=4\lim_{n\to\infty}\frac{n(n+1)(2n+1)}{6n^3}=4\left(\frac{2}{6}\right)=\frac{4}{3}$$

10. $$\lim_{x\to 1}\left((1-x)\tan\left(\frac{\pi x}{2}\right)\right)$$

let $1-x=y\Rightarrow x=1-y$

$$\Rightarrow \lim_{y\to 0}\left(y\tan\left(\frac{\pi(1-y)}{2}\right)\right)\Rightarrow \lim_{y\to 0}\left(y\cot\frac{\pi y}{2}\right)$$

$$\Rightarrow \lim_{y\to 0}\frac{\frac{\pi y}{2}}{\left(\tan\frac{\pi y}{2}\right)\frac{\pi}{2}}\Rightarrow \frac{2}{\pi}(1)=\frac{2}{\pi}$$

11. Given: $$\lim_{x\to 0}\frac{\sin(x^m)}{(\sin x)^n}=\lim_{x\to 0}\frac{x^m\sin(x^m)}{x^m\frac{(\sin x)^n}{x^n}x^n}$$

$$=\lim_{x\to 0}\frac{x^m}{x^n}\left(\frac{\sin(x^m)}{x^m}\right).\frac{1}{\left(\frac{\sin x}{x}\right)^n}$$

$$=\lim_{x\to 0}x^{m-n}(1)=0\quad(\because n<m)$$

12. $\lim_{x\to 3}\left(\frac{x^n-3^n}{x-3}\right)=108$

$\lim_{x\to a}\frac{x^n-a^n}{x-a}=n.a^{n-1}$

$n.3^{n-1}=108 \Rightarrow m.3^n=324$

put $n=4$

13. $\lim_{x\to 0}\frac{\left(1+\frac{x}{2}\right)^{\frac{5}{7}}-1}{x} \Rightarrow \lim_{x\to 0}\frac{\left(1+\frac{x}{2}\right)^{\frac{5}{7}}-1}{\left(1+\frac{x}{2}\right)-1}\times\frac{1}{2}$

put $1+\frac{x}{2}=y \Rightarrow \lim_{y\to 1}\frac{y^{\frac{5}{7}}-1}{y-1}\times\frac{1}{2}$

$=\frac{5}{7}.\frac{1}{2}=\frac{5}{14}$

14. $e^{\lim_{x\to\infty}3x\left(1+\frac{2}{x}-1\right)}=e^6$

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

16. $\lim_{n\to\infty}\left\{n-\sqrt{n^2-4n}\right\}$

$=\lim_{n\to\infty}\left\{n-\sqrt{n^2-4n}\times\frac{n+\sqrt{n^2-4n}}{n+\sqrt{n^2-4n}}\right\}$

$=\lim_{n\to\infty}\frac{4n}{n+\sqrt{n^2-4n}}=\frac{4}{2}=2$

17. $f(x)>0$, $3x<6x<9x$, $1<\lim_{x\to\infty}\frac{f(6x)}{f(3x)}<1$

From sandwich theorem $\lim_{x\to\infty}\frac{f(6x)}{f(3x)}=1$

18. $\lim_{x\to 0}\frac{x^4+x^3+x^2}{\sin^{-1}\frac{x}{\sqrt{1+x^2}}.\tan^{-1}x}$

$\lim_{x\to 0}\frac{(x^2+x+1)\sqrt{1+x^2}}{\left(\frac{\text{Sin}^{-1}\frac{x}{\sqrt{1+x^2}}}{\frac{x}{\sqrt{1+x^2}}}\right)\left(\frac{\text{Tan}^{-1}x}{x}\right)}=1$

19. $\lim_{x\to 0}\frac{(1+x)\log(1+x)}{x^2}-\frac{1}{x}$

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

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

$\lim_{x\to 0}\left\{\frac{1}{x}-\frac{1}{2}+\frac{x}{3}-\frac{x^2}{4}+....+1-\frac{x}{2}+\frac{x^2}{3}-...-\frac{1}{x}\right\}$

$=1-\frac{1}{2}+0-0+.....$

$=1-\frac{1}{2}=\frac{1}{2} \qquad \therefore k=\frac{1}{2}$

$12k=6$

20. $\frac{0}{0}$ form

Apply L.H rule 2 times

$=\frac{\pi^2}{2}$

21. $\lim_{x\to 0}\frac{1-\cos(1-\cos x)}{x^4}\bullet\frac{1}{\lim_{x\to 0}\frac{\sin^4 x}{x^4}}$

$=\lim_{x\to 0}\frac{1-\cos(2\sin^2\frac{x}{2})}{x^4}=\lim_{x\to 0}\frac{2\sin^2(\sin^2\frac{x}{2})}{x^4}=\frac{1}{8}$

22. $\frac{\left(\frac{1}{3}\right)(1)^{-2/3}}{\frac{1}{6}(1)^{-5/2}}=2$

23. Coefficient of n^3, $\frac{4}{1}=4$

24. $\frac{a}{b}=\frac{11}{13} \Rightarrow a+b=24$

25. Put $x=1+h$

26. $\lim_{x\to 1}\frac{\left|\sqrt{2}\sin(x-1)\right|}{x-1}$ does not exists

27. IPE

28. Conceptual

29. $\lim_{x\to0}\frac{8\left\{\left(1-\cos^2\frac{x^2}{2}\right)\left(1-\cos^2\frac{x^2}{4}\right)\right\}}{x^8}$

$8\left(\frac{\left(\frac{1}{2}\right)^2}{2}\right)\left(\frac{\left(\frac{1}{4}\right)^2}{2}\right)=\frac{1}{32}$

30. $\lim_{x\to\infty}\frac{10^n\left\{\left(\frac{1}{10}\right)^n-1\right\}}{10^n\left\{\left(\frac{1}{10}\right)^n+10\right\}}=\frac{-\infty}{10}$

$\Rightarrow\frac{-1}{10}=\frac{-\alpha}{10}\Rightarrow a=10$

31. $e^{\lim_{x\to\infty}\left(\frac{x+6}{x+1}-1\right)(x+4)}$

$e^{\lim_{x\to\infty}\frac{5(x+4)}{x+1}}=e^5$

32. Put $x=\tan\theta$

33. CONCEPTUAL

34. Deg Nr < deg Dr

35. $\lim_{x\to0}x^7\left[\frac{1}{x^3}\right]=0$

36. $e^{\lim_{x\to0}x\log(1+a^2)\frac{1}{x}}=2a\sin^2\theta\Rightarrow\frac{1+a^2}{2a}=\sin^2\theta$

$\sin^2\theta\in[0,1]$

$\Rightarrow\frac{1+a^2}{2a}\geq1\Rightarrow\sin^2\theta=1\Rightarrow\theta=2n\pi\pm\frac{\pi}{2}$

37. $\lim_{x\to0}\frac{x^2 2^x-x^2\sin x-x^2}{3^x+\cos x-3^x\cos x-1}$

$=\lim_{x\to0}\frac{x^2\left(2^x-\sin x-1\right)}{(1-\cos x)\left(3^x-1\right)}$

$=\lim_{x\to0}\frac{\left(\frac{2^x-1}{x}\right)-\left(\frac{\sin x}{x}\right)}{\left(\frac{1-\cos x}{x^2}\right)\left(\frac{3^x-1}{x}\right)}=\frac{\log2-1}{\frac{1}{2}\times\log3}$

$=\frac{2}{\log3}(\log2-1)$

38. Conceptual

39. $\lim_{x\to0}\frac{(1-\cos2x)}{x\tan2x+\frac{2x}{3}\tan3x}$

$=\lim_{x\to0}\frac{\frac{(1-\cos2x)}{x^2}}{\frac{x\tan2x+\frac{2x}{3}\tan3x}{x^2}}$

$=\lim_{x\to0}\frac{\left(\frac{1-\cos2x}{x^2}\right)}{\frac{\tan2x}{2}+\frac{2}{3}\cdot\frac{\tan3x}{3}}=\frac{4/2}{2+\frac{2}{3}\times3}=\frac{2}{4}=\frac{1}{2}$

40. Given $f(x)=\tan^{-1}\left[\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right]$

Put

$x=\cos\theta\qquad x\to\frac{1}{2},\ \theta=\cos^{-1}x\qquad\theta\to\frac{\pi}{3}$

$\Rightarrow f(x)=\tan^{-1}\left[\tan\left(\frac{\pi}{4}-\frac{\theta}{2}\right)\right]=\frac{\pi}{4}-\frac{\theta}{2}$

$\Rightarrow f(x)=\frac{\pi}{4}-\frac{1}{2}\cos^{-1}x\Rightarrow f\left(\frac{1}{2}\right)=\frac{\pi}{6}$

Now

$\lim_{x\to1/2}\frac{2[f(x)-f(1/2)]}{2x-1}=\lim_{x\to1/2}\frac{\frac{\pi}{4}-\frac{1}{2}\cos^{-1}x-\frac{\pi}{6}}{x-1/2}$

$=\lim_{x\to1/2}\frac{\frac{\pi}{12}-\frac{1}{2}\cos^{-1}x}{x-\frac{1}{2}}=\frac{1}{\sqrt3}$ (using L.H. rule)

41. $\lim_{x\to1}\frac{\log x}{(1-x)}$, *By L.H Rule* $\lim_{x\to1}\frac{\frac{1}{x}}{-1}=-1$

42. $f(x)=\begin{cases}\frac{\sin[x]}{[x]}, & [x]\neq0\Rightarrow x\in I-\{0\}\\ 0, & [x]=0\Rightarrow x\in(R-I)\cup\{0\}\end{cases}$

$$\lim_{x\to 0^-} f(x) = \lim_{x\to 0^-}\frac{\sin[x]}{[x]} = \lim_{x\to 0}\frac{\sin(-1)}{(-1)} = \sin 1$$

43. $\lim_{x\to -\infty}\frac{3|x|^3 - x^2 + 2|x| - 5}{-5|x|^3 + 3x^2 - 2|x| + 7}$

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

44. $f(x) = -\left[\sin^2 x + \cos^5 x\right]$

$f'(x) = -\left[\sin 2x + 5\cos^4 x(-\sin x)\right]$

$= -\sin 2x + 5\cos^4 x\sin x$

$\lim_{x\to 0}\frac{1}{x}f'(x) = \lim_{x\to 0}\left[\frac{-\sin 2x + 5\cos^4 x\sin x}{x}\right]$

$= \lim_{x\to 0}\left[\frac{-\sin 2x}{x}\right] + \lim_{x\to 0}\left[\frac{5\cos^4 x\sin x}{x}\right]$

$= -2 + 5 = 3$

45. $\lim_{n\to\infty} P\left[1 + \frac{r}{100n}\right]^{m} \Rightarrow Pe^{\lim_{n\to\infty}\left[1 + \frac{r}{100n} - 1\right]tn}$

$Pe^{\lim_{n\to\infty}\left[\frac{r}{100n}\right]tn} = Pe^{\frac{tr}{100}}$

46. Let a,b are roots of $px^2 + qx + r = 0$

$a + b = \frac{-q}{p}, ab = \frac{r}{p}$

$\lim_{x\to b}\frac{1 - \cos 2(px^2 + qx + r)}{2(px - pb)^2}$

$\lim_{x\to b}\frac{1 - \cos 2(p(x-a)(x-b))}{2p^2(x-b)^2}$

$\lim_{x\to b}\frac{2\sin^2 p(x-a)(x-b)}{2(p(x-b))^2(x-a)^2}\times(x-a)^2$

$\lim_{x\to b}(x-a)^2 = (b-a)^2 = b^2 - 2ab + a^2$

47. $f(x) = \frac{x^3 + 2x^2 + x + 2}{x^2 + x - 2}$

$\lim_{x\to -2}\frac{-8 + 4 - 2 + 2}{4 - 2 - 2} = \frac{-4}{0} = \infty$

By LH–Rule

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

48.

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

$= \lim_{x\to 0^-}\frac{1}{\sqrt{2}}\cdot\left(\frac{-\sin x}{x}\right)$ $As\ x\to \bar{0} \Rightarrow x < 0 \Rightarrow |x| = -x$

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

49. Apply L-Hospital rule '3' times, we get

$\lim_{x\to 0}\frac{2\sin x - \sin 2x}{x^3}$

$= \lim_{x\to 0}\frac{2\cos x - 2\cos 2x}{3x^2} = \lim_{x\to 0}\frac{-2\sin x + 4\sin 2x}{6x}$

$= \lim_{x\to 0}\frac{-2\cos x + 8\cos 2x}{6} = \frac{6}{6} = 1$

(or)

Method 2: $\frac{2-1}{1} = 1$

50. Conceptual

51. Conceptual

52. If 0 <x< 1then $x^n = 0$

$\log_x^{12}$ = negative

53.

54. $\underset{x\to\alpha}{\mathrm{Lt}}\frac{|a(x-l)(x-m)|}{a(x-l)(x-m)} = \frac{|a|}{a}$ if $l < \alpha < m$

55. For $x = 1,\ a + b = 1$ (verify)

56. $\underset{x\to -\infty}{lt}\log(\cosh x) + x$

$= \underset{x\to -\infty}{lt}\log\left(\frac{e^x + e^{-x}}{2}\right) + x$

$= \underset{x\to -\infty}{lt}\log(e^x + e^{-x}) + x - \log 2$

$= \underset{x\to -\infty}{lt}\log e^{-x} + x - \log 2$

$= -\log 2$

57. $\frac{b-c}{a-b} = \frac{1}{2} \Rightarrow a + 2c = 3b$

58. $x\to -\infty \Rightarrow x < 0$

$$\frac{-3x-x}{-x-2x}-\underset{x\to 0}{\mathrm{Lt}}\frac{\log\left(1+x^3\right)}{\sin^3 x}\times\frac{x^3}{x^3}$$

$$=\frac{4}{3}-1=\frac{1}{3}$$

59. Take $\left(2+\sqrt{2}\right)^n$ as common

Let $2+\sqrt{2}=a,\ 2-\sqrt{2}=b$

$$\underset{n\to\infty}{\mathrm{Lt}}\left[\frac{1+\left(\frac{b}{a}\right)^n}{1-\left(\frac{b}{a}\right)^n}\right]=1\left(\because 0<\frac{b}{a}<1\right)$$

60. Let a=2

$$\underset{x\to -2^-}{lt}\frac{8}{2}-0=4=k$$

$$\underset{x\to -2^+}{lt}\left(\frac{8}{2}-1\right)=3=l$$

$$k-l=1$$

61. When $x<0\Rightarrow nx<0$

$$\Rightarrow e^{nx}<0$$

$$n\to\infty,\ e^{nx}\to 0$$

62. Apply partial fractions

63.

$$1^\infty, e^{\underset{n\to\infty}{Lt} n\left[\frac{a+b^{\frac{1}{n}}-1}{a}-1\right]}=e^{\underset{n\to\infty}{Lt}\frac{n\left(b^{\frac{1}{n}}-1\right)}{a}}$$

$$=e^{\frac{\underset{\frac{1}{n}\to 0}{Lt}\left(b^{\frac{1}{n}}-1\right)}{\frac{1}{n}}\cdot\frac{1}{a}}=e^{(\log b)^{\frac{1}{a}}}=b^{\frac{1}{a}}$$

64. Apply L.H rule

65. $$\tan^{-1}\left(\frac{\left(r+\frac{1}{2}\right)-\left(r-\frac{1}{2}\right)}{1+\left(r+\frac{1}{2}\right)\left(r-\frac{1}{2}\right)}\right)=\tan^{-1}\left(r+\frac{1}{2}\right)-\tan^{-1}\left(r-\frac{1}{2}\right)$$

Apply $\sum_{r=1}^{n}$ $\Rightarrow \tan^{-1}\left(n+\frac{1}{2}\right)-\tan^{-1}\left(\frac{1}{2}\right)$

$$=\frac{\pi}{2}-\tan^{-1}\left(\frac{1}{2}\right)=\cot^{-1}\left(\frac{1}{2}\right)=\tan^{-1}2$$

66. $$\underset{x\to 0}{Lt}\left(\frac{(a-n)nx-\tan x}{x}\right)\frac{\sin nx}{x}$$

$$\Rightarrow\underset{x\to 0}{\mathrm{Lt}}\frac{(a-n)nx}{x}-n$$

$=n\left[(a-n)-1\right]$ by verify

$a=2$ is minimum

67.

Apply $e^{\underset{x\to a}{lt}\, g(x)[f(x)-1]}$

68.

$$k=\underset{n\to\infty}{\mathrm{Lt}}\ x^2\left(\frac{e^{\frac{1}{x}}-0}{e^{\frac{1}{x}}+0}\right)=0$$

$$l=\underset{x\to 0^-}{\mathrm{Lt}}\ x^2\left(\frac{0-e^{\frac{-1}{x}}}{0+e^{\frac{-1}{x}}}\right)=0$$

$$k=l$$

69. $$k=\underset{x\to\infty}{Lt}\frac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}+1}=\frac{1-1}{1+1}=0\left[\begin{array}{l}x\to\infty\Rightarrow\frac{1}{x}\to 0\\ e^{\frac{1}{x}}\to 1\end{array}\right]$$

70. Put $x=0$ $\dfrac{\sqrt{11-6\sqrt{2}}}{6-2\sqrt{2}}=\dfrac{3-\sqrt{2}}{2\left(3-\sqrt{2}\right)}=\dfrac{1}{2}$

71. Put $x=0$

Ans. 0 (option 3)

72. Put $x=-a$, LH rule

$$7x^6=7,\ (-a)^6=1\Rightarrow a=\pm 1$$

73. $$\underset{x\to\frac{\pi}{2}}{Lt}\,Tan\left(\frac{\pi}{7}-\frac{x}{2}\right).\frac{[1-\sin x]}{(\pi-2x)^3}$$

$$\underset{x\to\frac{\pi}{2}}{Lt}\frac{Tan\left(\frac{\pi}{7}-\frac{x}{2}\right)}{\left(\frac{\pi}{2}-x\right)}\frac{\left[1-\cos\left(\frac{\pi}{2}-x\right)\right]}{\left(\frac{\pi}{2}-x\right)^2}\times\frac{1}{8}=\frac{1}{32}$$

74. Let $x_n=l$

$$\therefore l=\frac{a+bl}{b+cl}\Rightarrow bl+cl^2=a+bl$$

$$l^2=\frac{a}{c}\Rightarrow l=\sqrt{\frac{a}{c}}\left(\because x_n>0\ \forall n\in N\right)$$

75. Apply $\cos x=1-\frac{x^2}{2!}+\frac{x^4}{4!}........$

$$e^x=1+\frac{x}{11}+\frac{x^2}{2!}+....$$

76. $\underset{x\to0}{Lt}\frac{x^2\log(\cos x)}{\log(1+x^2)}=\underset{x\to0}{Lt}\frac{x^2}{\log(1+x^2)}\cdot\underset{x\to0}{Lt}\log(\cos x)$

$=1\times\log1=0$

77. $x\to\frac{\pi}{2}+\Rightarrow[\sin x]=1,\ [\cos x]=0$

$\therefore\frac{1-0+1}{2}=1$

78. $\underset{n\to\infty}{Lt}\left(\frac{e^{-nx}\cos x-1}{e^{-nx}-A}\right),\quad e^{-nx}\to0\Rightarrow\frac{0-1}{0-A}=\frac{1}{A}$

79.

$$f(x)=\underset{y\to\infty}{lt}\frac{\left(x^{\frac{1}{y}}-1\right)}{\frac{1}{y}},\quad f(x)=\log x$$

$\therefore 2022(-\log x)+p\log x=2\log x$

$p\log x=(2024)\log x\Rightarrow p=2024$

80. $\frac{0}{0}$ form apply L.H. Rule

81. $\underset{x\to0}{Lt}\frac{2^{2x}-2^{x+1}+1+1-\cos2x}{x^2}=$

$$\underset{x\to0}{Lt}\frac{2^{2x}-2^{x+1}+1}{x^2}+\underset{x\to0}{Lt}\frac{1-\cos2x}{x^2}=\left(\frac{0}{0}form\right)+2$$

$$=\underset{x\to0}{Lt}\frac{(2^x-1)^2}{x^2}+2=(\log e)^2+2$$

82. Apply L.H rule

83. $\underset{x\to0}{Lt}\frac{4!}{x^8}\left(1-\cos\frac{x^2}{3}\right)\left(1-\cos\frac{x^2}{4}\right)$

$$\underset{x\to0}{Lt}4!\left(\frac{1-\cos\frac{x^2}{3}}{x^4}\right)\left(\frac{1-\cos\frac{x^2}{4}}{x^4}\right)$$

$$=24\times\frac{1}{18}\times\frac{1}{32}=\frac{1}{24}$$

84. $\underset{x\to1}{Lt}\frac{\sin(\cos x^2)-\sin(\cos1)}{x-1}$

Apply L.H.Rule

85. $0\times$ Finite $+\underset{x\to2}{Lt}\frac{x^2-4}{x^3-2x-4}$

$$=0+\underset{x\to2}{Lt}\frac{2x}{3x^2-2}=\frac{4}{8}=\frac{1}{2}$$

86. $\underset{x\to0}{Lt}\frac{2Tanx\left(1-\frac{1}{Tan^2x}-1\right)}{\frac{(1-\cos x)}{x^2}\frac{(2^x-1)}{x}}$

$$=\frac{2}{\left(\frac{1}{2}\right)\log2}\underset{x\to0}{Lt}\frac{Tan^3x}{x^3}=\frac{4}{\log2}$$

87. $\underset{k\to1}{lt}\frac{n-(k+k^2+k^3+...+k^n)}{1-k}=171$

$$\underset{k\to1}{lt}\frac{(1-k)+(1-k^2)+......+(1-k^n)}{1-k}=171$$

$$\Rightarrow\underset{k\to1}{lt}1+(1+k)+....+(1+k+....+k^{n-1})=171$$

$$\Rightarrow\sum n=171\ \therefore n=18$$

88. $\underset{x\to\infty}{Lt}\frac{x^3\left(x^2+\sqrt{x^4+1}-2x^2\right)}{\sqrt{x^2+\sqrt{x^4+1}}+\sqrt{2}x}$

$$\underset{x\to\infty}{Lt}\frac{x^3\left(x^2+\sqrt{x^4+1}-2x^2\right)}{x\sqrt{1+\sqrt{1+\frac{1}{x^4}}+\sqrt{2}}}$$

$$\underset{x\to\infty}{Lt}\frac{x^2(1)}{\left(2\sqrt{2}\right)\left(\sqrt{x^2+1}+x^c\right)}=\frac{1}{2\sqrt{2}(2)}=\frac{1}{4\sqrt{2}}$$

89. $l_1=4-3=1, l_2=4-4=0, l_1+l_2=1$

90. $\underset{x\to0}{\text{Lt}}\left(\frac{2^x-1}{x}\right)\frac{x}{\log(1+2x)}=\frac{\log 2}{2}=\log\sqrt{2}$

$$\underset{x\to0}{Lt}(1+\text{sinx})^{\frac{2}{\text{sinx}}}=e^{\frac{2}{\text{sinx}}(\text{sinx})}=e^2$$

$\therefore e^2\log\sqrt{2}$

91. $\left(\frac{0}{0}\right)$ L.H. Rule

92.
$$\underset{x\to0}{Lt}\frac{4.2\cos\left(\frac{4042x}{2}\right)\sin(x)}{x\left[\cos(2022x)+2\cos(2021x)+\cos x\right]}$$

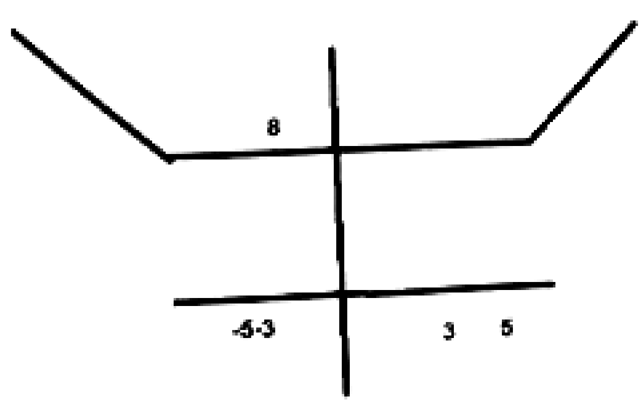
$$=\frac{8\times1}{1+2+1}=\frac{8}{4}=2$$

93. $F(X) = |X-3| + |X+5|$

$X\le-5$ $\quad 3-X-5-X=-2-2X$

$-5\le X\le3$ $\quad 3-X+X+5=8$

$X\ge3$ $\quad X-3+X+5=2X+2$



F is not differentiable at $x=-5$ but $-5\in$ A

No of real no's =1

94. Given

$$\lim_{x\to1}\left(\lim_{y\to\infty}y(ex)^{1/y}-1\right)=$$

$$\lim_{y\to\infty}\frac{e^{\frac{1}{y}}-1}{\frac{1}{y}}=1$$

95. A is true

$\left(\because As\ x\to0,\frac{1}{x}\to\infty\right)$ R is true

$\left(\because \textit{value of } x \textit{ decreases, the value of } \frac{1}{x} \textit{ increases}\right)$

96.
$$f(x)=\begin{vmatrix}1 & 6+x & 36+x^2\\ 0 & x-3 & 3x^2-27\\ 0 & 2x-4 & 8x^2-32\end{vmatrix}$$

$$f(1)=\begin{vmatrix}1 & 7 & 37\\ 0 & -2 & -24\\ 0 & -2 & -24\end{vmatrix}=0$$

$$f(-1)=\begin{vmatrix}1 & 5 & 37\\ 0 & -4 & -24\\ 0 & -6 & -24\end{vmatrix}\ne0$$

$$\lim_{x\to1}\frac{f(1)}{f(-1)}=\frac{0}{\textit{finite value}}=0$$

97. $\underset{x\to m}{Lt}\frac{xf(m)-mf(x)}{x-m}+f^1(m)=f(m)$

By applying L.H Rule , it

$$\lim_{x\to m}\frac{f(m)-mf'(x)}{1-0}+f'(m)=f(m)$$

$$f(m)-mf'(m)+f'(m)=f(m)$$

$$f^1(m)(-m+1)=0$$

$$\because f^1(m)\ne0,\quad m=1$$

98. $\underset{x\to2}{lt}\frac{1+\sqrt{1+4\log_2 x}}{2+(2x+\sin^2x+2\cos x)(2x-4)}=m$

$$m=\frac{1+\sqrt{5}}{2+0}$$

$$m(m-1)=\left(\frac{\sqrt{5}+1}{2}\right)\left(\frac{\sqrt{5}-1}{2}\right)=1$$

99. $\lim_{x\to -1^-} \frac{1-x+\sqrt{9x^2+10x+1}}{2x}$

$=\frac{1+1+\sqrt{9-10+1}}{2(-1)}$

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

100. Using L.H. Rule

$\lt_{x\to -9} \frac{(2.5)^{81-x^2}\log(2.5)(-2x)-(0.4)^{x+9}\log(0.4)}{1}$

= 18 log 2.5 – log 0.4

= 18 log 2.5 + 18 log 0.4 – 19 log 0.4

= 18 log 1 – 19 log 0.4

=- 19 log 0.4

101. $S_n = 1 + 3x + 9x^2 + 27x^3 + \ldots\ldots +$ n terms

$= 1 + (3x) + (3x)^2 + (3x)^3 + \ldots\ldots\ldots$

These are in G.P as $\frac{-1}{3}<x<\frac{1}{3}$ $\quad |3x|<1$

$f(x)=\lt_{n\to\infty} S_n = \lt_{n\to\infty} 1+3x+(3x)^2+\ldots..+(\infty)$

$= \lt_{n\to\infty} \frac{1}{1-3x}$

It is not defined at 1 – 3x = 0 , $x=\frac{1}{3}$

102. $A:[x]=x, x\to\infty \Rightarrow \lt_{x\to\infty} \frac{x}{x}=1$ (conceptual)

$R: x-1\le [x]<x$

$\lim_{x\to\infty}\frac{x-1}{x}\le\lim_{x\to\infty}\frac{[x]}{x}<\lim_{x\to\infty}\frac{x}{x}$, $\lim_{x\to\infty}\frac{[x]}{x}=1$

103. $\lim_{x\to m} f(x)=5/2 \Rightarrow \sqrt{\frac{m}{1-m}}+\sqrt{\frac{1-m}{m}}=\frac{5}{2}$

$t+\frac{1}{t}=\frac{5}{2}, t=2\,(or)\,\frac{1}{2}$

$\frac{m}{1-m}=4, m=\frac{4}{5}\, or\, \frac{m}{1-m}=\frac{1}{4}, m=\frac{1}{5}$

$\frac{m}{1-m}=\frac{1}{4}\Rightarrow m=\frac{1}{5}$

104. $\lim_{x\to 1}\frac{2x^{3/2}-2x-3\sqrt{x}+3}{2x^2+x-3}$

apply LH rule

105. $\lim_{x\to\infty} x\left(a^{\frac{1}{x}}+b^{\frac{1}{x}}+c^{\frac{1}{x}}-3k^{\frac{1}{x}}\right)=0$

$\lim_{x\to\infty}\frac{\left(a^{\frac{1}{x}}+b^{\frac{1}{x}}+c^{\frac{1}{x}}-3k^{\frac{1}{x}}\right)}{\frac{1}{x}}=0$

$\lim_{1/x\to 0}\left(\frac{a^{\frac{1}{x}}-k^{\frac{1}{x}}}{\frac{1}{x}}\right)+\lim_{1/x\to 0}\left(\frac{b^{\frac{1}{x}}-k^{\frac{1}{x}}}{\frac{1}{x}}\right)+\lim_{1/x\to 0}\left(\frac{c^{\frac{1}{x}}-k^{\frac{1}{x}}}{\frac{1}{x}}\right)=0$

$\log a+\log b+\log c-(\log k+\log k+\log k)=0$

$k^3=\log(abc)$

$k=(abc)^{\frac{1}{3}}$

106. IPE

107. Given that $f(9)=9, f^{I}(9)=4$

$\lim_{x\to 9}\frac{\sqrt{f(x)}-3}{\sqrt{x}-3}=4$

By $L-$hospital rule

108. $4+\cancel{2}-\cancel{2}+16+16+3$

109. $\lim_{x\to 0}\left(\frac{\left(3^{2x}-\sqrt{x+1}\right)\left(3^{2x}+\sqrt{x+1}\right)}{\left(3^{2x}+\sqrt{x+i}\right)}\right)\times\frac{\frac{\sin 5x}{x^2}}{\frac{1-\cos 4x}{x^2}}$

$\lim_{x\to 0}\frac{3^{4x}-x-1}{x}.\lim_{x\to 0}\frac{1}{\left(3^{2x}+\sqrt{x+1}\right)}\frac{\frac{\sin 5x}{x}}{\frac{1-\cos 4x}{x^2}}$

$$=(\log 81-\log e).\frac{1}{2}.\frac{5}{8}=\frac{5}{16}\log\left(\frac{81}{e}\right)$$

110

$$=\lim_{n\to\infty}\frac{1}{n^3}\sum_{k=1}^{n}\left(k^2x\right)$$

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

$$=\frac{2}{6}x=\frac{x}{3}$$

111. $$l=\lim_{\theta\to 0}\frac{3\sin\theta-4\sin^3\theta}{\theta}=3$$

$$\mathrm{m}=\underset{\theta\to 0}{Lt}\frac{2\tan\theta}{\theta(1-\tan^2\theta)}=2$$

required Quadratic eqn is $x^2-5x+6=0$

112.

$$\lim_{x\to 2}\frac{\sqrt[3]{6+x}-\sqrt[3]{10-x}}{x-2}$$

$$\lim_{x\to 2}\frac{1}{3}(6+x)^{-2/3}+\frac{1}{3}(10-x)^{-2/3}$$

$$\frac{1}{3}(8)^{-2/3}+\frac{1}{3}(8)^{-2/3}$$

$$\frac{1}{3}.\frac{1}{4}+\frac{1}{3}.\frac{1}{4}=\frac{1}{12}+\frac{1}{12}=\frac{2}{12}=\frac{1}{6}$$

113. $$\lim_{x\to 0}\frac{\tan^4 x-\sin^4 x}{x^6}$$

$$\lim_{x\to 0}\frac{\frac{\sin^4 x}{\cos x}-\sin^4 x}{x^6}$$

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

$$\lim_{x\to 0}\frac{\sin^4 x}{x^4}.\lim_{x\to 0}\frac{1-\cos^4 x}{x^2}.\lim_{x\to 0}\frac{1}{\cos^4 x}$$

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