MATHS

BOOKS - CENGAGE MATHS (HINGLISH)

LIMITS AND DERIVATIVES

Solved Examples And Exercises

1. Evaluate the limit: $(\lim)_{x \to 0} \frac{\sin ax}{\sin bx}$

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2. If $(\lim)_{x \to 1} \frac{a\sin(x-1) + b\cos(x-1) + 4}{x^2 - 1} = -2, then |a + b|$ is______

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3. Evaluate the limit $(\lim)_{x \to 0} \frac{\sin 3x}{x}$

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4. The integer n for which $\lim_{x \to 0} \frac{(\cos x - 1)(\cos x - e^x)}{x^n}$ is finite nonzero number is _______

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5. Evaluate the limit: $(\lim)_{n \to \infty} \left(\frac{1^2 - 2^2 + 3^3 - 4^2 + 5^2 + nterms}{n^2} \right.$

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6. Let $(\lim)_{x \overrightarrow{1}} \frac{x^a - ax + a - 1}{(x-1)^2} = f(a)$. Then the value of $f(4)$ is

____

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7. Evaluate the limit: $(\lim)_{x \to a} \frac{\sqrt{3x - a} - \sqrt{x + a}}{x - a}$

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8. $f(x) = \frac{3x^2 + ax + a + 1}{x^2 + x - 2}$ and $\lim_{x \to -2} f(x)$ exists. Then the value of $(a - 4)$ is________

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9. Evaluate the limit: $(\lim)_{x \overrightarrow{\infty}} \left[\sqrt{a^2 x^2 + ax + 1} - \sqrt{a^2 x^2 + 1}\right]$

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10. $\lim_{x \to 0} \frac{1 - \sqrt{\cos 2x} \cdot \sqrt[3]{\cos 3x} \ldots . \cdot \sqrt[n]{\cos nx}}{x^2}$ has value 10, then value of n equal to

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11. Evaluate the limit: $(\lim)_{x\overrightarrow{1}}\left(\sum k=1\right)\frac{100x^k-100}{x-1}$

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12. Let $S_n=1+2+3+\ +n$ and $P_n=\frac{S_2}{S_2-1}\cdot\frac{S_3}{S_3-1}\cdot\frac{S_4}{S_4-1}\cdot\cdot\cdot\frac{S_n}{S_n-1}$ Where $n\in N,(n\geq 2)$. Then $\lim_{x\to\infty}P_n=$ _____

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13. If $a_1=1anda_{n+1}=\frac{4+3a_n}{3+2a_n}, n\geq 1, and$ if $(\lim)_{n\overrightarrow{\infty}}a_n=a$, then find the value of $a\cdot$

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14. If $L=(\lim)_{x\overrightarrow{\infty}}\left\{x-x^2(\log)_e\left(1+\frac{1}{x}\right)\right\}$, then the value of $8L$ is_____

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15. Evaluate the limit: $(\lim)_{n \to \infty} \cos\left(\pi\sqrt{n^2+n}\right)$ when n is an integer

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16. Evaluate: $\lim_{x \to a} \frac{\sqrt{a+2x}-\sqrt{3x}}{\sqrt{3a+x}-2\sqrt{x}}, (a \neq 0)$.

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17. Evaluate the limit: $(\lim)_{x \to 0} \frac{\sqrt{2}-\sqrt{1+\cos x}}{\sin^2 x}$

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18. Let f^x be continuous at $x=0$ If $(\lim)_{x \to 0}\left(2f(x)-3a\frac{f(2x)+bf(8x)}{\sin^2 x}\right.$ exists and $f(0) \neq 0, f'(0) \neq 0,$ then the value of $\frac{3a}{b}$ is____

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19. Evaluate the limit: $(\lim)_{h \vec{0}}\left[\frac{1}{h8+h3}-\frac{1}{2h}\right]$

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20. Evaluate: $\lim_{x \to 0} \frac{e-(1+x)^{\frac{1}{x}}}{x}$

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21. Using $(\lim)_{\theta \vec{0}} \frac{\sin\theta}{\theta}-1$ prove that the area of circle of radius R is πR^2 (Figure)

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22. Evaluate: $(\lim)_{n \vec{1}} \frac{\sec\pi}{2^x} \log x.$

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23. Evaluate: $(\lim)_{x \xrightarrow{} 0} \frac{\sin x}{x}, where[.]$ represents the greatest integer function.

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24. Let $f(x) = (\lim)_{n \xrightarrow{} \infty}\left\{(\lim)_{n \xrightarrow{} \infty} \cos^{2m}(n!\pi x)\right\},$ where $x \in R.$ Then prove that $f(x) = \{1, \quad \text{if} \quad \xi s rational 0, \quad \text{if} \quad \xi s irrational$

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25. Evaluate: $\lim_{x \to \frac{\pi}{2}} \frac{1 + \cos 2x}{(\pi - 2x)^2}$

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26. Evaluate:

$(\lim)_{n \xrightarrow{} \infty} n^{-n} \,\hat{}\, 2\left\{\left(n + 2^0\right)n + 2^{-1}\right)\left(n + 2^{-2}\right)\left(n + 2^{-n+1}\right)\right\}^n$

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27. $\lim \{x \to \infty\} 2^{x-1} \tan\left(\frac{a}{2^x}\right)$

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28. Evaluate $\lim_{x \to \pi/2} \frac{\sin x - (\sin x)^{\sin x}}{1 - \sin x + \log_e \sin x}$.

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29. Evaluate: $\lim_{x \to 2} \frac{x^2 - x - 2}{x^2 - 2x - \sin(x - 2)}$

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

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31. Evaluate: $\lim_{x \to \infty} x\left(\tan^{-1}\left(\frac{x+1}{x+4}\right) - \frac{\pi}{4}\right)$

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32. Evaluate the value of

$(\lim)_{n\vec{\frac{\pi}{2}}} \tan^2 x\sqrt{(2\sin^2 x + 3\sin x + 4) - \sqrt{\sin^2 x + \sin x + 2}}$

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33. Evaluate the limit: $(\lim)_{\vec{x1}} \frac{\sin(\log x)}{\log x}$

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34. Evaluate: $(\lim)_{\vec{n0}} \frac{\cos^2(1 - \cos^2(1 - \cos^2(\cos^2(\theta))))}{s \in \left(\pi \frac{\sqrt{(\theta+4)} - 2}{\theta}\right)}$

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35. Evaluate: $(\lim)_{x \rightarrow 0} \frac{1}{x} \sin^{-1}\left(\frac{2x}{1+x^2}\right)$

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36. At the endpoint and midpoint of a circular are AB, tangent lines are drawn, and the points, A and B are jointed with a chord. Prove that the ratio of the areas of the triangles thus formed tends to 4 as the arc AB decreases infinitely.

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37. Evaluate: $(\lim)_{x \rightarrow 0} \frac{1 - \cos 2x}{x^2}$

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38. Evaluate $(\lim)_{n \rightarrow 0} \frac{x - \sin x}{x^3}$. (Do not use either LHospitals rule or series expansion for $\sin x$). Hence, evaluate

$(\lim)_{n\vec{0}}\frac{\sin x - x\cos x + x^2\cot x}{x^5}$

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39. Evaluate: $(\lim)_{x\vec{0}}\frac{\tan x - \sin x}{x^3}$

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40. The value of $(\lim)_{x\vec{0}}\left[\frac{1}{n} + \frac{e^{\frac{1}{n}}}{n} + \frac{e^{\frac{2}{n}}}{n} + + \frac{e^{\frac{n-1}{n}}}{n}\right] is$ 1 (b) 0 (c) $e-1$

(d) $e+1$

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41. Find the values of a and b in order that $\lim_{x\to 0}\frac{x(1+a\cos x) - b\sin x}{x^3} = 1$ [using L' Hospital' srule].

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42. $(\lim)_{x\overrightarrow{1}}\frac{nx^{n+1}-(n+1)x^n+1}{(e^x-e)\sin\pi x}, where n=100,$ is equal to : $\frac{5050}{\pi e}$ (b) $\frac{100}{\pi e}$ (c) $-\frac{5050}{\pi e}$ (d) $-\frac{4950}{\pi e}$

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43. Find the integral value of n for which $\lim_{x\to 0}\frac{\cos^2 x-\cos x-e^x\cos x+e^x-\frac{x^3}{2}}{x^n}$ is a finite nonzero number

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44. If $\lim_{x\to\infty}\left(\frac{x^2+x+1}{x+1}-ax-b\right)=4, then$ (a)$a=1, b=4$ (b) $a=1, b=-4$ (c)$a=2, b=-3$ (d) $a=2, b=3$

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45. Evaluate: $\lim_{x\to 0}\frac{\log\cos x}{x}$

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46. Let $L = \lim_{x \to 0} \frac{a - \sqrt{a^2 - x^2} - \frac{x^2}{4}}{x^4}, a > 0$. If L is finite , then (a)a=2 (b)a=1(c)L=1/(64)(d)L=1/(32)`

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47. Evaluate: $(\lim)_{x \overrightarrow{0}} \frac{2^x - 1}{(1+x)^{\frac{1}{2}} - 1}$

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48. The largets value of non negative integer for which $\lim_{x \to 1} \frac{(-ax + \sin(x-1) + a]1 - \sqrt{x}}{x + \sin(x-1) - 1}\Bigg\}^{\frac{1-x}{1-\sqrt{x}}} = \frac{1}{4}$

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49. Evaluate: $\lim_{x \to 0} x^x$

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50. Let m and n be two positive integers greater than 1.If $\lim_{\alpha \to 0} \frac{e^{\cos \alpha^n} - e}{\alpha^m} = -\left(\frac{e}{2}\right)$ then the value of $\frac{m}{n}$ is

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51. Evaluate: $(\mathrm{dy}/\mathrm{dx}) of \tan x \log \sin x$

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52. The integer n for which $\lim_{x \to 0} \frac{(\cos x - 1)(\cos x - e^x)}{x^n}$ is finite nonzero number is _______

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53. If $m, n \in I_0 and (\lim)_{x \to 0} \frac{\tan 2x - n \sin x}{x^3} =$ some integer, then find the value of n and also the value of limit.

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54. If $(\lim)_{x \to 0} \frac{\{(a-n)nx - \tan x\} \sin nx}{x^2} = 0,$ where n is nonzero real number, the a is 0 (b) $\frac{n+1}{n}$ (c) n (d) $n + \frac{1}{n}$

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55. If $(\lim)_{\underset{x \ 0}{\rightarrow}} \frac{\cos 4x + a \cos 2x + b}{x^4}$ is finite, find $a and b$ using expansion formula.

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56. The value of $\lim_{x \to 0} \left((\sin x)^{\frac{1}{x}} + \left(\frac{1}{x}\right)^{\sin x} \right)$, where $x > 0,$ is 0 (b) -1 (c) 1 (d) 2

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57. If $\lim_{x \to a} \frac{a^x - x^a}{x^x - a^a} = -1$ and $a > 0$, then find the value of a.

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58. If $\lim_{x \to 0} \left[1 + x1n\left(1 + b^2\right)\right]^{\frac{1}{x}} = 2b\sin^2\theta, b > 0$,where $\theta \in (-\pi, \pi]$, then the value of θ is (a)$\pm\frac{\pi}{4}$ (b) $\pm\frac{\pi}{3}$ (c) $\pm\frac{\pi}{6}$ (d) $\pm\frac{\pi}{2}$

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59. If $L = \lim_{x \to 0} \frac{\sin 2x + a\sin x}{x^3}$ is finite, then find the value of $aandL$.

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60. Evaluate: $(\lim)_{n \overrightarrow{\infty}} \left(\frac{a1^{\frac{1}{x}} + a2^{\frac{1}{x}} + \ + an^{\frac{1}{x}}}{n}\right)^{nx}$

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61. Evaluate: $(\lim)_{x\to 0}\frac{\sin x^0}{x}$

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62. Evaluate: $(\lim)_{\overrightarrow{n\,0}}\frac{1-\cos(1-\cos x).}{x^4}$

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63. Evaluate: $\left[(\lim)_{x\to 0}\frac{\tan^{-1}x}{x}\right]$, where [.]represent the greatest integer function

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64. Let $f(x)=\{x+1, x>02-x, x\leq 0$ and $g(x)=\{x+3, x<1, x^2-2x-2, 1\leq x<2x-5, x\geq 2$ Find the LHL and RHL of $g(f(x))$ at $x=0$ and, hence, fin $\lim_{x\to 0} g(f(x))$.

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65. Evaluate: $(\lim)_{x\vec{\frac{\pi}{4}}}\frac{\sqrt{2}\cos x-1}{\cot x-1}$

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66. $\lim_{x\to 0}\left[(1-e^x)\frac{\sin x}{|x|}\right]is(where[.]$ represents the greatest integer function). (a) -1 (b) 1 (c) 0 (d) does not exist

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67. Evaluate: $(\lim)_{x\vec{0}}\frac{1-\cos mx}{1-\cos nx}$

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68. $\lim_{x\to\infty}\frac{\cot^{-1}(x^{-a}\log_a x)}{\sec^{-1}(a^x\log_x a)}, (a>1)$ is equal to (a)2 (b)1 (c) $(\log)_a 2$ (d) 0

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69. Evaluate: $\lim_{x \to 0} \frac{\tan 2x - x}{3x - \sin x}$

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70. The value of $\lim_{x \to a} \sqrt{a^2 - x^2} \frac{\cot \pi}{2} \sqrt{\frac{a - x}{a + x}}$ is $\frac{2a}{\pi}$ (b) $-\frac{2a}{\pi}$ (c) $\frac{4a}{\pi}$ (d) $-\frac{4a}{\pi}$

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71. Evaluate: $(\lim)_{x \overrightarrow{0}} \frac{\cot 2x - \cos ec2x}{x}$

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72. $\lim_{x \to 0} \frac{\log(1 + x + x^2) + \log(1 - x + x^2)}{\sec x - \cos x} =$ (a)-1 (b) 1 (c) 0 (d) 2

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73. Evaluate: $\left(\lim_{n\to\infty} n\cos\left(\frac{\pi}{4n}\right)\sin\left(\frac{\pi}{4n}\right)\right)$

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74. The value of $\left(\lim_{n\to\infty}\left[\frac{2n}{2n^2-1}\frac{\cos(n+1)}{2n-1}-\frac{n}{1-2n}\frac{n(\dot{-}1)^n}{n^2+1}\right]is\right.$

1 (b) -1 (c) 0 (d) none of these

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75. Evaluate: $\lim_{h\to 0}\frac{2\left[\sqrt{3}\sin\left(\frac{\pi}{6}+h\right)-\cos\left(\frac{\pi}{6}+h\right)\right]}{\sqrt{3}h\left(\sqrt{3}\cosh-\sinh\right)}$

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76. Evaluate:

$(\lim)_{x\to 0}\frac{8}{x^8}\left\{1-\cos\left(\frac{x^2}{2}\right)-\cos\left(\frac{x^2}{4}\right)+\cos\left(\frac{x^2}{2}\right)\cos\left(\frac{x^2}{4}\right)\right\}$

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77. Evaluate: $(\lim)_{x\vec{0}} \frac{\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)}{\sin^{-1}x}$

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78. Evaluate:

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

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79. Evaluate: $(\lim)_{x\vec{0}x\vec{0}} \frac{y^2+\sin x}{x^2+\sin y^2}$ where $(x, y)\vec{0},$ along the curve $x=y^2$

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80. Evaluate $(\lim)_{n\overrightarrow{\infty}}\left\{\cos\left(\frac{x}{2}\right)\cos\left(\frac{x}{4}\right)\cos\left(\frac{x}{8}\right)\cos\left(\frac{x}{2^n}\right)\right\}$

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81. Find the value of α so that $\lim_{x\to 0}\frac{1}{x^2}\left(e^{\alpha x}-e^x-x\right)=\frac{3}{2}$

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82. If x_1 and x_2 are the real and distinct roots of $ax^2+bx+c=0$, then prove that $\lim_{n\to x_1}\left\{1+\sin\left(ax^2+bx+c\right)\right\}^{\frac{1}{x-x_1}}=e^{a(x_1-x_2)}$

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83. If $\lim_{x\to 0}\left(1+ax+bx^2\right)^{\frac{2}{x}}=e^3$, then find the value of a and b.

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84. Evaluate: $(\lim)_{n \xrightarrow{} \infty} x \left[\tan^{-1}\left(\frac{x+1}{x+2}\right) - \tan^{-1}\left(\frac{x}{x+2}\right)\right]$

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85. If $(\lim)_{x \xrightarrow{} \infty} \left\{\frac{x^2+1}{x+1} - (ax+b)\right\} = 0,$ then find the value of $aandb.$

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86. Evaluate: $(\lim)_{n \xrightarrow{} 0} \frac{2^x - 1 - x}{x^2},$ without using LHospitals rule and expansion f the series.

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87. If $(\lim)_{x \xrightarrow{} 0} \frac{ae^x - b}{x} = 2,$ then find the value of $aandb.$

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88. Evaluate: $(\lim)_{n\overrightarrow{1}}\frac{\sin\{x\}}{\{x\}}$ if exists, where $\{x\}$ is the fractional part of $x\cdot$

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89. Evaluate: $(\lim)_{x\overrightarrow{-}2^{+}}\frac{x^{2}-1}{2x+4}$

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90. Evaluate: $(\lim)_{n\overrightarrow{0}}\left(1^{1}/\sin^{2x}+\frac{2^{1}}{\sin^{2x}}++n^{1}/\sin^{2x}\right)^{\sin}\hat{}\,(2x)$

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91. Let $f(x)=\{\cos[x], x\geq 0|x|+a, x<0$ The find the value of $a,$ so that $(\lim)_{x\overrightarrow{0}}f(x)$ exists, where $[x]$ denotes the greatest integer function less than or equal to x .

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92. If $y = 2^{-2^{\left(\frac{1}{1-x}\right)}}$, then find $\lim_{x \to 1^+} y$

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93. Let $f(x) = \begin{cases} 1 + \frac{2x}{a}, 0 \leq x < 1 \text{ and } ax, 1 \leq x < 2 \end{cases}$ If $\lim_{x \to 1} f(x)$ exists ,then a is (a)1 (b) -1 (c) 2 (d) -2

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94. Evaluate $(\lim)_{\underset{x\ 0}{\to}} \frac{\sin x - 2}{\cos x - 1}$

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95. $(\lim)_{x \to 0} \left(\frac{\sin(\pi \cos^2 x)}{x^2}\right)$ is equal to (a) $-\pi$ (b) π (c) $\frac{\pi}{2}$ (d) 1

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96. Evaluate $\lim_{x \to 0^-} \frac{x^2 - 3x + 2}{x^3 - 2x^2}$

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97. For $x \in R$, $\lim_{x \to \infty} \left(\frac{x-3}{x+2}\right)^x$ is equal to (a) e (b) e^{-1} (c) e^{-5} (d) e^5

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98. Evaluate $\lim_{n \to \infty} \left[\sum_{r=1}^{n} \frac{1}{2^r}\right]$, where [.] denotes the greatest integer function.

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99. $(\lim)_{x \overrightarrow{\infty}} \left\{\frac{1}{1-n^2} + \frac{2}{1-n^2} + \frac{n}{1-n^2}\right\} isequa < o$ 0 (b) $-\frac{1}{2}$ (c) $\frac{1}{2}$ (d) none of these

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100. Evaluate $(\lim)_{x \overrightarrow{\frac{5\pi}{4}}} [\sin x + \cos x]$, where [.] denotes the greatest integer function.

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101. If $G(x) = -\sqrt{25 - x^2}, then \lim_{x \to 1} \frac{G(x) - G(1)}{x - 1} is$ (a) $\frac{1}{24}$ (b) $\frac{1}{5}$ (c) $-\sqrt{24}$ (d) none of these

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102. Evaluate the left-and right-hand limits of the function defined by $f(x) = \begin{cases} 1 + x^2 & 0 \leq x < 1 \\ 2 - x & x > 1 \end{cases}$ at $x = 1$ Also, show that $\lim_{x \to 1} f(x)$ does not exist

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103. If $f(x)=\sqrt{\frac{x-\sin x}{x+\cos^2 x}}$, then $\lim\ (x\to\infty)f(x)$ is

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104. Evaluate the left-and right-hand limits of the function $f(x)=\left\{\frac{|x-4|}{x-4}, x\ne 40, x=4atx=4\right.$

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105. If $(\lim)_{x\vec{a}}[f(x)g(x)]$ exists, then both $(\lim)_{x\vec{a}}f(x)and(\lim)_{x\vec{a}}g(x)$ exist.

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106. If $\alpha_1, , \alpha_2, , \alpha_n$ are the roots of equation $x^n+nax-b=0,$ show that $(\alpha_1-\alpha_2)(\alpha_1-\alpha_2)(\alpha_1-\alpha_n)=n(\alpha 1n-1+a)$

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107. $\lim_{x \to 0} \left(\frac{x \tan 2x - 2x \tan x}{(1 - \cos 2x)^2}\right)$ is equal to

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108. Evaluate: $(\lim)_{x \to 0} \frac{\sin^{-1} x - \tan^{-1} x}{x^3}$

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109. $\lim_{x \to 1} \frac{\sqrt{1 - \cos 2(x - 1)}}{x - 1}$ a. exists and its equals $\sqrt{2}$ b. exists and its equals $\sqrt{-2}$ c.does not exist because $x - 1 \to 0$ d. L.H.L not equal R.H.L

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110. $\lim_{x \to 0} \sin^2\left(\frac{\pi}{2 - px}\right)^{\sec^2\left(\left(\frac{\pi}{2 - qx}\right)\right)}$

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111. The value of $\lim_{x \to 0} \frac{\sqrt{\frac{1}{2}(1 - \cos 2x)}}{x}$ is (a)1 (b) -1 (c) 0 (d) none of these

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112. Evaluate: $(\lim)_{x \xrightarrow{} \frac{7}{2}} (2x^2 - 9x + 8)^{\cot(2x-7)}$

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113. If $f(x) = \left\{ \frac{\sin[x]}{[x]}, f \text{ or } [x] \neq 00, f \text{ or } [x] = 0, where[x]\right.$ denotes the greatest integer less than or equal to x, then $(\lim)_{x \xrightarrow{} 0} f(x)$ is 1 (b) 0 (c) -1 (d) none of these

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114. Let $f(a) = g(a) = k$ and their nth derivatives exist and are not equal for some n. If. $(\lim)_{x \overrightarrow{a}} \frac{f(a)g(x) - f(a) - g(a)f(x) + g(a)}{g(x) - f(x)} = 4$

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115. If $f(x) = \begin{cases} x^n \sin\left(\frac{1}{x^2}\right) & x \neq 0 \\ 0 & x = 0 \end{cases}$, $(n \in I)$, then (a) $\lim_{x \to 0} f(x)$ exists for $n > 1$ (b) $\lim_{x \to 0} f(x)$ exists for $n < 0$ (c) $\lim_{x \to 0} f(x)$ does not exist for any value of n (d) $\lim_{x \to 0} f(x)$ cannot be determined

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116. Let $f(x)$ be a twice-differentiable function and $f(0) = 2$. The evaluate: $(\lim)_{x \overrightarrow{0}} \frac{2f(x) - 3f(2x) + f(4x)}{x^2}$

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117. The value of $\lim_{x \to 1}\left(\frac{p}{1-x^p}-\frac{q}{1-x^q}\right), p, q, \in N,$ equal (a) $\frac{p+q}{2}$ (b) $\frac{pq}{2}$ (c) $\frac{p-q}{2}$ (d) $\sqrt{\frac{p}{q}}$

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118. Evaluate : $\lim_{x \to 0}(\log)_{\tan^2 x}\left(\tan^2 2x\right)$.

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119. $(\lim)_{x \vec{0}}\frac{\sin\left(x^2\right)}{1n(\cos(2x^2-x))} isequa < o$ 2 (b) -2 (c) 1 (d) -1

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120. If the graph of the function $y=f(x)$ has a unique tangent at the point $(a, 0)$ through which the graph passes, then evaluate $(\lim)_{x \vec{a}}\frac{(\log)_e\{1+6f(x)\}}{3f(x)}$

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121. $\lim_{x \to -1} \frac{1}{\sqrt{|x| - \{-x\}}}$ $(where\{x\}$ denotes the fractional part of $(x))$ is equal to (a)does not exist (b) 1 (c)∞ (d) $\frac{1}{2}$

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122. Evaluate: $\lim_{x \to 0} x^m (\log x)^n, m, n \in N$.

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123. Let $f(x) = (\lim)_{x \vec{\infty}} \frac{1}{\left(\frac{3}{\pi}\tan^{-1} 2x\right)^{2n} + 5}$. Then the set of values of x for which $f(x) = 0$ is $|2x| > \sqrt{3}$ (b) `|2x|

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124. Evaluate `("lim")_(xvecoo)x(log)_e{(sin(a+1/x))/(sina)},0

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125. $\lim_{x \to 0} \left\{(1+x)^{\frac{2}{x}}\right\}$ (where {.} denotes the fractional part of x (a) $e^2 - 7$ (b) $e^2 - 8$ (c) $e^2 - 6$ (d) none of these

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126. Evaluate: $(\lim)_{x \to 0} \frac{2^x - 1}{\sqrt{1+x} - 1}$

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127. If $f(n+1) = \frac{1}{2}\left\{f(n) + \frac{9}{f(n)}\right\}, n \in N,$ and $f(n) > 0$ for all $n \in N,$ then find $\lim_{n \to \infty} f(n)$

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128. Evaluate $\lim_{x \to 1} \frac{a^{x-1} - 1}{\sin \pi x}$.

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129. Find $(\lim)_{n\overrightarrow{\infty}}\frac{5x+2\cos x}{3x+14}$ using sandwitch theorem

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130. Evaluate: $(\lim)_{x\overrightarrow{0}}\frac{\tan x}{x}$ where $[.]$ represents the greatest integer function

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131. If $\lim_{n\to\infty}\frac{1}{(\sin^{-1}x)^{\text{n}}+1}=1$, $then$ find the value of x.

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132. Evaluate: $(\lim)_{x\overrightarrow{0}}\frac{\tan x}{x}$ where $[.]$ represents the greatest integer function

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

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134. Evaluate: $(\lim)_{x \overrightarrow{2}} \frac{x - 2}{(\log)_a (x - 1)}$

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135. Evaluate: $\lim_{n \to 0} \frac{e^{\sin x} - (1 + \sin x)}{\{\tan^{-1}(\sin x)\}^2}$

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136. Evaluate: $(\lim)_{x \overrightarrow{a}} \frac{\log x - \log a}{x - a}$

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137. Evaluate: $\left(\lim\right)_{n \xrightarrow{} \frac{3\pi}{4}} \frac{1 \tan x 3}{1 - 2\cos^2 x}$

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138. Evaluate: $(\lim)_{x \xrightarrow{} 0} \frac{10^x - 2^x - 5^x + 1}{x \tan x}$

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139. $(\lim)_{x \xrightarrow{} 1} \frac{\left(\frac{x^4 + x^2 + x + 1}{x^2 - x + 1}\right)^{1 - \cos(x+1)}}{(x+1)^2} isequa < o \quad 1$ (b) $\left(\frac{2}{3}\right)^{\frac{1}{2}}$ (c) $\left(\frac{3}{2}\right)^{\frac{1}{2}}$ (d) $e^{\frac{1}{2}}$

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140. Evaluate: $(\lim)_{x \xrightarrow{} 0} \frac{3^{2x} - 2^{3x}}{x}$

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141.

$$(\lim)_{x\overrightarrow{2}}\left(\left(\frac{x^3-4x}{x^3-8}\right)^{-1}-\left(\frac{x+\sqrt{2x}}{x-2}-\frac{\sqrt{2}}{\sqrt{x}-\sqrt{2}}\right)^{-1}\right)isequa<o$$

$\frac{1}{2}$ (b) 2 (c) 1 (d) none of these

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142. Evaluate: $(\lim)_{x\overrightarrow{0}}\frac{\log(5+x)-\log(5-x)}{x}$

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143. Each question contains statements given in two columns which have to be matched. Statements a,b,c,d in column I have to be matched with statements p,q,r,s in column II. If the correct match are a-p, a-s, b-r, c-p, c-q, and d-s, then the correctly bubbled 4 x 4 matrix should be as follows: fig Column I, Column II If $L=(\lim)_{x\overrightarrow{1}}\frac{(7-x)3-2}{(x+1)}, then12L=$, p. -2 If $L=(\lim)_{x\overrightarrow{\frac{\pi}{4}}}\frac{\tan^3 x-\tan x}{\cos\left(x+\frac{\pi}{4}\right)}, then-\frac{L}{4}=$, q. 2 If

$L = (\lim)_{x \overrightarrow{1}} \frac{(2x-3)(\sqrt{x}-1)}{2x^2+x-3}, then 20L =$, r. 1 If $L = (\lim)_{x \overrightarrow{\infty}} \frac{\log x^n - [x]}{[x]}, where n \in N,$ $([x]$ denotes greatest integer less than or equal to $x), then -2L =$, s. -1

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144. Leg $p_n = a^{P_{n-1}} - 1, \forall n = 2, 3, , and let P_1 = a^x - 1,$ where $a \in R^+$. Then evaluate $(\lim)_{x \overrightarrow{0}} \frac{P_n}{x}$

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145. Column I ([.] denotes the greatest integer function), Column II

$(\lim)_{x \overrightarrow{0}} \left(\left[100 \frac{\sin x}{x} \right] + \left[100 \frac{\tan x}{x} \right] \right)$, p. 198

$(\lim)_{x \overrightarrow{0}} \left(\left[100 \frac{x}{\sin x} \right] + \left[100 \frac{\tan x}{x} \right] \right)$, q. 199

$(\lim)_{x \overrightarrow{0}} \left(\left[100 \frac{\sin^{-1} x}{x} \right] + \left[100 \frac{\tan^{-1} x}{x} \right] \right)$, r. 200

$(\lim)_{x \overrightarrow{0}} \left(\left[100 \frac{x}{\sin^{-1} x} \right] + \left[100 \frac{\tan^{-1} x}{x} \right] \right)$, s. 201

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146. Let $f(x) = \{x+1, x > 02 - x, x \leq 0$ and $g(x) = \{x+3, x < 1, x^2 - 2x - 2, 1 \leq x < 2x - 5, x \geq 2$ Find the LHL and RHL of $g(f(x))$ at $x = 0$ and, hence, fin $\lim_{x \to 0} g(f(x))$.

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147. Evaluate: $\lim_{x \to \infty} \frac{x + 7\sin x}{-2x + 13}$ using sandwich theorem.

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148. If $f(x) = \left\{\frac{x - |x|}{x}, x \neq 02, x = 0, showthat(\lim)_{\underset{x\ 0}{\rightarrow}} f(x)\right.$ does not exist.

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149. The reciprocal of the value of: $(\lim)_{\underset{x\ \infty}{\rightarrow}}\left(1 - \frac{1}{2^2}\right)\left(1 - \frac{1}{3^2}\right)\left(1 - \frac{1}{4^2}\right)\left(1 - \frac{1}{n^2}\right)is$

Watch Video Solution

150. Show that $(\lim)_{x \to 0} \frac{e^{\frac{1}{x}} - 1}{e^{\frac{1}{x}} + 1} does \neg e\xi st$

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151. : If $f(x) = \{x^2 + 2, x \geq 21 - x, x < 2and$ $g(x) = \begin{cases}2x, x > 13 - x, x \leq 0, thenthevalueof \lim_{x \to 1} f(g(x)) is_{-}\end{cases}$

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152. Evaluate : $(\lim)_{x \to 2^+} \frac{[x - 2]}{\log(x - 2)}$, where [.] represents the greatest integer function.

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153. The value of the limit $(\lim)_{x \to 0} \frac{a^{\sqrt{x}} - a^{1\sqrt{x}}}{a^{\sqrt{x}} + a^{1\sqrt{x}}}, a > 1, is$ 4 (b) 2 (c) -1

(d) 0

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154. Evaluate: $(\lim)_{x \to 0} \frac{\sin[\cos x]}{1 + [\cos x]}$ ([.] denotes the greatest integer function).

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155. $\lim_{x \to 0} \left(\frac{1^x + 2^x + \ldots\ldots\ldots. + n^x}{n}\right)^{\frac{1}{x}}$ is equal to

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156. Consider the following graph of the function $y = f(x)$. Which of the following is/are correct? fig. $(\lim)_{x \to 1} f(x)$ does not exist. $(\lim)_{x \to 2} f(x)$ does not exist. $(\lim)_{x \to 3} f(x) = 3$

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157. If $\lim_{x \to 0} \frac{x^n - \sin x^x}{x - \sin^n x}$ is non-zero finite, then n must be equal to 4 (b) 1 (c) 2 (d) 3

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158. If $(\lim)_{x \to a}[f(x) + g(x)] = 2 and (\lim)_{x \to a}[f(x) - g(x)] = 1,$ then find the value of $(\lim)_{x \to a} f(x)g(x)\cdot$

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159. Among (i) $\lim_{x \to \infty} \sec^{-1}\left(\frac{x}{\sin x}\right)$ and $(ii) \lim_{x \to \infty} \sec^{-1}\left(\frac{\sin x}{x}\right).$

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160. Evaluate $(\lim)_{x \to 0} \frac{3x + |x|}{7x - 5|x|}$

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161. The value of $(\lim)_{x \overrightarrow{0}} \frac{1 + \sin x - \cos x + \log(1 - x)}{x^3} is \frac{1}{2}$ (b) $-\frac{1}{2}$ (c) 0 (d) none of these

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162.

$f(x) = \{x, x \leq 01, x = 0, then f \in d(\lim)_{x \overrightarrow{0}} f(x)x^2, x > 0 \text{ if } e\xi sts$

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163. $\lim_{x \to \infty} \frac{e^{\frac{1}{x^2}} - 1}{2\tan^{-1}(x^2) - \pi}$ is equal to (a) 1 (b) -1 (c) $\frac{1}{2}$ (d) $-\frac{1}{2}$

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164. Evaluate: $\lim_{x \to \infty} \left(1 + \frac{1}{a + bx}\right)^{c + dx}$, where a, b, c and dare positive

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165. If $x_1 = 3$ and $x_{n+1} = \sqrt{2 + x_n}, n \geq 1, then(\lim)_{x \to \infty} x_n$ is (a) -1 (b) 2 (c) $\sqrt{5}$ (d) 3

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166. Evaluate: $(\lim)_{x \to \infty} \left(1 + \frac{1}{x}\right)^x$

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167. $(\lim)_{x \overrightarrow{0}} \frac{\cos(\tan x) - \cos x}{x^4} isequa < o$ $\frac{1}{6}$ (b) $-\frac{1}{3}$ (c) $\frac{1}{2}$ (d) 1

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168. Evaluate: $(\lim)_{x \to 0}\left(\frac{a^x + b^x + c^x}{3}\right)^{\frac{2}{x}}; (a, b, c > 0)$

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169. $(\lim)_{x \to \infty}\{x + 5) \tan^{-1}(x + 5) - (x + 1)\tan^{-1}(x + 1)\}$ is equal to π (b) 2π (c) $\frac{\pi}{2}$ (d) none of these

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170. $f(n) = \lim_{x \to 0}\left\{\left(1 + \frac{\sin x}{2}\right)\left(1 + \frac{\sin x}{2^2}\right) \ldots\ldots \left(1 + \frac{\sin x}{2^n}\right)\right\}^{\frac{1}{x}}$

then find $\lim_{n \to \infty} f(n)$

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171. If $\lim_{x \to 2^-} \frac{ae^{\frac{1}{|x+2|}} - 1}{2 - e^{\frac{1}{|x+2|}}} = \lim_{x \to 2^+} \sin\left(\frac{x^4 - 16}{x^5 + 32}\right)$, then a is

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172. The population of a country increases by 2% every year. If it increases k times in a century, then prove that $[k] = 7, where[.]$ represents the greatest integer function.

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173. $\lim_{x \to o}\left[\frac{x^4 \sin\left(\frac{1}{x}\right) + x^2}{1 + |x|^3}\right] =\_ \quad \_\_ \ \_$

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174. Evaluate the limit: $(\lim)_{x \overrightarrow{\infty}}\left(\frac{x+2}{x+1}\right)^{x+3}$

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175. ABC is an isosceles triangle inscribed in a circle of radius $r \cdot$ If $AB = AC$ and h is the altitude from A to $BC,$ then triangle ABC has perimeter $P = 2\left(\sqrt{2hr - h^2} + \sqrt{2hr}\right)$ and area A= __________ and = ________ and also $(\lim)_{x \to 0} \frac{A}{P^3} =$_ __ _

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176. Evaluate: $(\lim)_{x \to \frac{\pi}{2}} (\cos x)^{\cos x}$

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177. $(\lim)_{x \to 0} \left(x^4 \frac{\cot^4 x - \cot^2 x + 1}{(\tan^4 x - \tan^2 x + 1) isequa < o}\right.$ 1 (b) 0 (c) 2 (d) none of these

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178. Evaluate: $(\lim)_{x \to 0} (1 + x)^{osecxc}$

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179. $(\lim)_{x \to \infty}\left(\frac{1}{e}-\frac{x}{1+x}\right)^{x}$ is equal to (a) $\frac{e}{1-e}$ (b) 0 (c) $\frac{e}{e^{1-e}}$ (d) does not exist

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180. Evaluate: $(\lim)_{x \to 0}(\cos x)^{\cot x}$

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181. $\lim_{x \to 1}\frac{1-x^2}{\sin 2\pi x}$ is equal to (a) $\frac{1}{2\pi}$ (b) $-\frac{1}{\pi}$ (c) $\frac{-2}{\pi}$ (d) none of these

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182. Evaluate $(\lim)_{x \to 0}\left(\frac{\sin x}{x}\right)^{\left(\frac{\sin x}{x-\sin x}\right)}$

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183. $\lim_{x \to \infty} \left(\frac{x^2 + 2x - 1}{2x^2 - 3x - 2}\right)^{\frac{2x+1}{2x-1}}$ is equal to (a) 0 (b) ∞ (c) $\frac{1}{2}$ (d) none of these

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184. Evaluate: $(\lim)_{x \to 0} \frac{(1+x)^{\frac{1}{x}} - e + \frac{1}{2}ex}{x^2}$

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185. $(\lim)_{x \to 0} \frac{x^a \sin^b x}{\sin(x^c)}$, where a , b , c in R ~{0},exists and has non-zero value. Then, $a + c$ = (a) b (b) -1 0 (d) none of these

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186. $(\lim)_{x \to 0} \frac{5 \sin x - 7 \sin 2x + 3 \sin 3x}{x^2 \sin x}$

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187. $(\lim)_{x \to \infty} \left\{ \frac{x^3+1}{x^2+1} - (ax+b) \right\} = 2, then$ (a)$a = 1, b = 1$ (b) $a = 1, b = 2$ (c)$a = 1, b = -2$ (d) none of these

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188. Evaluate the following limits using sandwich theorem: $(\lim)_{x \to \infty} \frac{(\log)_e x}{x}$

Watch Video Solution

189. The value of $\lim_{x \to 1} (2-x)^{\tan\left(\frac{\pi x}{2}\right)}$ is $e^{-\frac{2}{\pi}}$ (b) $e^{\frac{1}{\pi}}$ (c) $e^{\frac{2}{\pi}}$ (d) $e^{-\frac{1}{\pi}}$

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190. Evaluate the following limits using sandwich theorem: $\lim_{x \to \infty} \frac{[x]}{x}, where[.]$ represents greatest integer function.

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191. `("lim")_(xvec0)(sinx^n)/((sinx)^m),(m

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192. If $\frac{x^2+x-2}{x+3} \leq \frac{f(x)}{x^2} \leq \frac{x^2+2x-1}{x+3}$ hold for a certain interval containing the point $x = -1$ and $\lim_{x \to 1} f(x)$ then find the value of $\lim_{x \to 1} f(x)$

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193. $(\lim)_{x \overrightarrow{\infty}} \frac{2\sqrt{x} + 3x3 + 4x4 + \ + nxn}{\sqrt{(2x-3)} + (2x-3)3 + \ + (2x-3)n} isequa < o$ 1 (b) ∞ (c) $\sqrt{2}$ (d) none of these

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194. Let $f:(1, 2)\overrightarrow{R}$ satisfies the inequality `(cos(2x-4)-33)/2

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195. $(\lim)_{x\overrightarrow{0}} \frac{(x+y)\sec(x+y) - x\sec x}{y} isequa < o\ \sec x(x\tan x + 1)$

(b) $x\tan x + \sec x\ x\sec x + \tan x$ (d) none of these

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196. Evaluate : $(\lim)_{x\to\infty} \frac{1}{1+n^2} + \frac{2}{2+n^2} + \ldots + \frac{n}{n+n^2}$

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197. If $L = \lim_{x\to 2} \frac{(10-x)^{\frac{1}{3}} - 2}{x-2}$, then the value of $\left|\frac{1}{4L}\right|$ is

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198. Suppose that f is a function such that $2x^2 \leq f(x) \leq x(x^2+1)$ for all x that are near to 1 but not equal to 1. Show that this fact contains enough information for us to find $(\lim)_{x \overrightarrow{1}} f(x)$. Also, find this limit.

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199. If $L = \lim_{x \to 0} \dfrac{e^{-\left(\frac{x^2}{2}\right)} - \cos x}{x^3 \sin x}$, then the value of $\dfrac{1}{3L}$ is

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200. If $[.]$ denotes the greatest integer function, then find the value of $(\lim)_{x \overrightarrow{0}} \dfrac{[x] + [2x] + \; + [nx]}{n^2}$

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201. If $lm_{x \to \infty} f(x)$ exists and is finite and nonzero and if $\lim_{x \to \infty} \left\{\left\{f(x) + \dfrac{3f(x) - 1}{f_2(x)}\right\}\right. = 3$,then the value of $\lim_{x \to \infty} f(x)$ is

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202. If $3-\left(\frac{x^2}{12}\right) \leq f(x) \leq 3+\left(\frac{x^3}{9}\right)$ for all $x \neq 0$, then find the value of $(\lim)_{x \rightarrow 0} f(x)$

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203. If

$f(x)=\{x-1, x \geq 12x^2-2, x<1, g(x)=\{x+1, x>0-x^2+1, x \leq$

$=|x|, then (\lim)_{x \rightarrow 0} f(g(h(x)))$ is___

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204. Evaluate the limits using the expansion formula of functions

$$(\lim)_{x \rightarrow 0}\left\{\frac{\sin x-x+\frac{x^3}{6}}{x^5}\right\}$$

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205. $\lim_{x \to \infty}$, $where \frac{2x-3}{3} < f(x) < \frac{2x^2+5x}{x^2}, is$

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206. Evaluate the limits using the expansion formula of functions $\lim_{x \to 0} \frac{\sin x + \log(1-x)}{x^2}$

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207. If $(\lim)_{x \to 0} \left[1 + x + \frac{f(x)}{x}\right]^{\frac{1}{x}} = e^3$, then find the value of $1n\left((\lim)_{x \to 0} \left[1 + \frac{f(x)}{x}\right]^{\frac{1}{x}}\right) is_{--}$

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208. Evaluate the limits using the expansion formula of functions $(\lim)_{x \to 0} \frac{e^x - 1 - x}{x^2}$

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209. The value of $(\lim)_{x \xrightarrow{} \infty}\left[(n+1)^2 3-(n-1)^2 3\right]$ is_____

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210. Evaluate : $(\lim)_{x \xrightarrow{} 2}\frac{x^2-5x+6}{x^2-4}$

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211. If: $(\lim)_{x \to 1}\left(1+ax+bx^2\right)^{\frac{c}{(x-1)}}=e^3,$ then the value ofbc is___

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212. Evaluate : $(\lim)_{x \xrightarrow{} 1}\left(\frac{2}{1-x^2}+\frac{1}{x-1}\right)$

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213. $(\lim)_{x \overrightarrow{0}}\left(\frac{1+5x^2}{1+3x^2}\right)^1 / x^2 =_{-} -$

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214. Evaluate : $(\lim)_{x \overrightarrow{1}} \frac{x^2 + x(\log)_e x - (\log)_e x - 1}{(x^2 - 1)}$

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215. If $L = (\lim)_{x \overrightarrow{\infty}} \frac{\left(2x3^2x2^3x3^4x2^{n-1}x3^n\right)^1}{\left(n^{2+1}\right)}$, then the value of L^4 is

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216. Evaluate $(\lim)_{x \overrightarrow{\frac{\pi}{4}}} \frac{1 - \sin 2x}{1 + \cos 4x}$

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217. The value of $(\lim)_{x\overrightarrow{\infty}}\left((\log)_e\frac{(\log)_e x}{e^{\sqrt{x}}}is_{\_}\ -_{\_}\ \ -_{\_}\ -_{\_}\right.$

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218. Evaluate : $(\lim)_{x\overrightarrow{\frac{\pi}{4}}}\frac{1-\cot^3 x}{2-\cot x-\cot^3 x}$

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219. $(\lim)_{\underset{x\ 0}{\rightarrow}}\frac{(x+y)\sec(x+y)-x\sec x}{y}isequa<o\ \sec x(x\tan x+1)$

(b) $x\tan x+\sec x\ x\sec x+\tan x$ (d) none of these

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220. Evaluate $(\lim)_{x\rightarrow 0}\frac{\sqrt{2+x}-\sqrt{2}}{x}$

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221. The value of $\lim_{m \to \infty}\left(\cos\left(\frac{x}{m}\right)\right)^{\mathrm{m}}$ is 1 (b) e (c) e^{-1} (d) none of these

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222. The value of $(\lim)_{x \to 0}\left(\sin x + (\log)_e \frac{\sqrt{1+\sin^2 x} - \sin x}{\sin^3 x}\right)$

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223. The value of $\lim_{h \to 0}\frac{In(1+2h) - 2\ln(1+h)}{h^2}$, is

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224. Evaluate : $(\lim)_{x \overrightarrow{\infty}}\frac{ax^2+bx+c}{dx^2+ex+f}$.

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225. The value of $\lim_{x \to 1}(2-x)^{\tan\left(\frac{\pi x}{2}\right)}$ is $e^{-\frac{2}{\pi}}$ (b) $e^{\frac{1}{\pi}}$ (c) $e^{\frac{2}{\pi}}$ (d) $e^{-\frac{1}{\pi}}$

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226. Evaluate: $(\lim)_{x \overrightarrow{2}} \frac{\sqrt{(x+7)} - 3\sqrt{(2x-3)}}{(x+63-2(3x-5)3)}$

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227. `("lim")_(xvec0)(sinx^n)/((sinx)^m),(m

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228. Evaluate: $(\lim)_{x \overrightarrow{\infty}} \frac{\sqrt{3x^2-1} - \sqrt{2x^2-1}}{4x+3}$

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229. $(\lim)_{x \overrightarrow{0}} \left(x^4 \frac{\cot^4 x - \cot^2 x + 1}{(\tan^4 x - \tan^2 x + 1) isequa < o} \right.$ 1 (b) 0 (c) 2 (d) none of these

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230. Evaluate: $(\lim)_{x \to \infty} \sin^n\left(\frac{2\pi n}{3n+1}\right), n \in N.$

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231. $(\lim)_{x \to \infty}\left(\frac{1}{e} - \frac{x}{1+x}\right)^x$ is equal to (a) $\frac{e}{1-e}$ (b) 0 (c) $\frac{e}{e^{1-e}}$ (d) does not exist

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232. Evaluate: $(\lim)_{x \to 1} \frac{\sqrt{x} + \sqrt{\sqrt{x}} + \sqrt{\sqrt{\sqrt{x}}} + \sqrt{\sqrt{\sqrt{\sqrt{x-4}}}}}{x-1}$

Watch Video Solution

233. $\lim_{x \to 1} \frac{1-x^2}{\sin 2\pi x}$ is equal to (a) $\frac{1}{2\pi}$ (b) $-\frac{1}{\pi}$ (c) $\frac{-2}{\pi}$ (d) none of these

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234. Evaluate $(\lim)_{x \rightarrow 2} \frac{x^{10} - 1024}{x^5 - 32}$

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235. $(\lim)_{x \rightarrow 0} \frac{1}{x} \cos^{-1}\left(\frac{1 - x^2}{1 + x^2}\right) isequa < o$ 1 (b) 0 (c) 2 (d) none of these

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236. If $(\lim)_{x \rightarrow 2} \frac{x^n - 2^n}{x - 2} = 80 amdm \in N, thenf \in dthevalueofn \cdot$

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237. $\lim_{x \rightarrow \infty} \left(\frac{x^2 + 2x - 1}{2x^2 - 3x - 2}\right)^{\frac{2x+1}{2x-1}}$ is equal to (a) 0 (b) ∞ (c) $\frac{1}{2}$ (d) none of these

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238. Evaluate: $\lim_{x \to a} \frac{(x+2)^{\frac{5}{3}} - (a+2)^{\frac{5}{3}}}{x-a}$

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239. $(\lim)_{x \overrightarrow{\infty}} \frac{2\sqrt{x} + 3x3 + 4x4 + \quad + nxn}{\sqrt{(2x-3)} + (2x-3)3 + \quad + (2x-3)n} isequa < o$ 1 (b) ∞ (c) $\sqrt{2}$ (d) none of these

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240. Evaluate: $\lim_{x \to \infty} \frac{\sqrt{x^2+1} - x^3 + 13}{x^4 + 14 - x^4 + 15}$

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241. The value of $\lim_{x \to 1} \frac{1 - \sqrt{x}}{(\cos^{-1} x)^2}$ is 4 (b) $\frac{1}{2}$ (c) 2 (d) $\frac{1}{4}$

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242. Evaluate : $(\lim)_{x \overrightarrow{\infty}} \sqrt{x}\left(\sqrt{x+c}-\sqrt{x}\right)$

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243. $\lim_{x \to \infty} \dfrac{(x+1)^{10}+(x+2)^{10}+\ldots+(x+100)^{10}}{x^{10}+10^{10}}$ is equal to

(a) 0

(b) 1

(c) 10

(d) 100

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244. Evaluate: $(\lim)_{x \overrightarrow{0}} \dfrac{e^{x}\ \hat{}\ 2-\cos x}{x^{2}}$

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245. $\lim_{x \to \infty}\left[\sqrt{x+\sqrt{x+\sqrt{x}}}-\sqrt{x}\right]$ is equal to (a)0 (b) $\frac{1}{2}$ (c) log 2 (d) e^4

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

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247. $\lim_{n \to \infty}\frac{n(2n+1)^2}{(n+2)(n^2+3n-1)}$ is equal to

(a)0

(b) 2

(c) 4

(d) ∞

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248. Evaluate: $(\lim)_{x \to 0} \frac{x2^x - x}{1 - \cos x}$

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249. $\lim_{x \to 0} \frac{x(e^x - 1)}{1 - \cos x}$ is equal to

A. 0

B. ∞

C. -2

D. 2

Answer: D

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250. Evaluate: $(\lim)_{x \to \infty} \left[x\left(a^{\frac{1}{x}} - 1\right)\right], a > 1$

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251. If $f(x)=\frac{2}{x-3}, g(x)=\frac{x-3}{x+4}$, and $h(x)=-\frac{2(2x+1)}{x^2+x-12}$ then $\lim_{x\to 3}[f(x)+g(x)+h(x)]$ is (a) -2 (b) -1 (c) $-\frac{2}{7}$ (d) 0

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252. Evaluate: $(\lim)_{x\to 0}\frac{(1-3^x-4^x+12^x)}{\sqrt{(2\cos x+7)}-3}$

Watch Video Solution

253. $\lim_{x\to\infty}\left(\frac{x^3}{3x^2-4}-\frac{x^2}{3x+2}\right)$ is equal to

(a)does not exist

(b) $1/3$

(c) 0

(d) $\frac{2}{9}$

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254. Evaluate: $(\lim)_{x \to 0} \frac{a^{\tan x} - a^{\sin x}}{\tan x - \sin x}, a > 0$

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255. $\lim_{x \to \infty} \frac{(2x+1)^{40}(4x-1)^{5}}{(2x+3)^{45}}$ is equal to

(a)16

(b) 24

(c) 32

(d) 8

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256. Evaluate: $(\lim)_{x \to a} \frac{\log(x-a)}{\log(e^x - e^a)}$

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257. The value of $\lim_{x \to 2} \frac{\sqrt{1+\sqrt{2+x}} - \sqrt{3}}{x-2}$ i s

A. $\dfrac{1}{8\sqrt{3}}$

B. $\dfrac{1}{4\sqrt{3}}$

C. 0

D. none of these

Answer: A

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258. Evaluate: $(\lim)_{x \overrightarrow{0}} \dfrac{e^x + e^{-x} - 2}{x^2}$

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259. $\lim_{x \to \infty} n^2 \left(x^{\frac{1}{n}} - x^{\frac{1}{(n+1)}} \right), x > 0$, is equal to (a)0 (b) e^x (c) $(\log)_e x$

(d) none of these

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260. Evaluate: $(\lim)_{x \xrightarrow{} \infty} x^{\frac{1}{x}}$

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261. The value of $(\lim)_{x \xrightarrow{} \pi} \frac{1+\cos^3 x}{\sin^2 x} is \frac{1}{3}$ (b) $\frac{2}{3}$ (c) $-\frac{1}{4}$ (d) $\frac{3}{2}$

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262. Evaluate: $\lim_{x \to 0} \frac{(729)^x - (243)^x - (81)^x + 9^x + 3^x - 1}{x^3}$

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263. If $f(x) = \frac{3x^2 + ax + a + 1}{x^2 + x - 2}$, then which of the following can be correct $(\lim)_{x \xrightarrow{} 1} f(x) e\xi sts a = -2$ $(\lim)_{x \xrightarrow{} -2} f(x) e\xi sts a = 13$ $(\lim)_{x \xrightarrow{} 1} f(x) = \frac{4}{3}$ $(\lim)_{x \xrightarrow{} -2} f(x) = -\frac{1}{3}$

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264. Evaluate:

$$(\lim)_{n \to \infty} (-1)^{n-1} \sin\left(\pi\sqrt{n^2 + 0.5n + 1}\right), where n \in N$$

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265. $(\lim)_{x \overrightarrow{\infty}} \frac{1}{1 + n\sin^2 nx} is equa < o - 1$ (b) 0 (c) 1 (d) ∞

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266. Let the sequence $\{b_n\}$ real numbers satisfies the recurrence relation $b_{n+1} = \frac{1}{3}\left(2b_n + \frac{125}{bn2}\right), b_n \neq 0.$ Then find the $(\lim)_{n \to \infty} b_n.$

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267. Which of the following true ({.} denotes the fractional part of the function)? $(\lim)_{x \overrightarrow{\infty}} \frac{(\log)_e x}{\{x\}} = \infty$ (b) $(\lim)_{x \overrightarrow{2}^+} \frac{x}{x^2 - x - 2} = \infty$ $(\lim)_{x \overrightarrow{1}^-} \frac{x}{x^2 - x - 2} = -\infty$ (d) $(\lim)_{x \overrightarrow{\infty}} \frac{(\log)_0 .5x}{\{x\}} = \infty$

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268. Evaluate: $(\lim)_{n \rightarrow \infty}\left(4^n+5^n\right)^{\frac{1}{n}}$

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269. If $(\lim)_{x \rightarrow 1^-}(2-x+a[x-1]+b[1+x])$ exists, then $a and b$ can take the values of (where [.] denotes the greatest integer function). (a) $a=\frac{1}{3}, b=1$ (b) $a=1, b=-1$ (c) $a=9, b=-9$ (d) $a=2, b=\frac{2}{3}$

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270. Evaluate: $(\lim)_{n \rightarrow \infty} \frac{n^{\psi} n^2(n!)}{n+1}$

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271. $(\lim)_{x \to \infty}\left(an - \frac{1+n^2}{1+n}\right) = b,$ where a is a finite number, then $a = 1$ (b) $a = 0$ (c) $b = 1$ (d) $b = -1$

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272. Evaluate: $(\lim)_{x \to \infty} x^3\left\{\sqrt{x^2 + \sqrt{1+x^4}} - x\sqrt{2}\right\}$

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273. If $m, n \in N$, $(\lim)_{x \to 0} \frac{\sin x^m}{(\sin x)^m} is\ 1, \quad \text{if} \quad n = m$ (b) $0, \quad \text{if} \quad n > m$

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274. Evaluate: $\lim_{x \to \infty} \sqrt[3]{(x+1)(x+2)(x+3)} - x$

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275. $\lim_{n \to \infty} \frac{-3n + (-1)^n}{4n - (-1)^n}$ is equal to a. $-\frac{3}{4}$ b. 0 if n is even c. $-\frac{3}{4}$ if n is odd d. none of these

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276. Evaluate : $(\lim)_{x \to \infty} \left(\sqrt{25x^2 - 3x} + 5x\right)$

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

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278. $L = (\lim)_{x \to a} \frac{|2\sin x - 1|}{2\sin x - 1}$. $Then$ limit does not exist when (a) $a = \frac{\pi}{6}$ (b) $L = -1 when a = \pi$ (c) $L = 1 when a = \frac{\pi}{2}$ (d) $L = 1 when a = 0$

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279. If $[x]$ denotes the greatest integer less than or equal to x, then evaluate $(\lim)_{n\overrightarrow{\infty}}\frac{1}{n^3}\{[1^2x]+[2^2x]+[3^2x]+\}[n^2x]\Big\}$

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280. $f(x)=(\lim)_{n\to\infty}\frac{x}{x^{2n}+1}\dot{T}hen,$ A. $f(1^+)+f(1^{-1})=0$ B. $f(1^+)+f(1^-)+f(1)=\frac{3}{2}$ C. $f(-1^+)+f(-1^-)=-1$ D. $f(1^+)+f(-1^-)=0$

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281. Evaluate the limit: $\lim_{x\to1}\frac{(2x-3)(\sqrt{x}-1)}{2x^2}$

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282. $(\lim)_{x \to \infty} \sum_{x=1}^{20} \cos^{2n}(x-10)$ is equal to (a) 0 (b) 1 (c) 19 (d) 20

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283. $\lim_{x \to 1} \frac{1+\sin\left(\frac{3\pi x}{1+x^2}\right)}{1+\cos \pi x}$ is (a) 0 (b) 1 (c) 2 (d) 3

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284. $f(x) = \frac{1n(x^2+e^x)}{1n(x^4+e^{2x})}\dot{T}hen \lim_{x \to \infty} f(x)$ is equal to (a) 1 (b) $\frac{1}{2}$ (c) 2 (d) none of these

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285. $(\lim)_{x \overrightarrow{\infty}}\{\left(\frac{n}{n+1}\right)^{\alpha} + s \in \frac{1}{n}\Big]^{n}$ (when $\alpha \in Q$) is equal to (a) $e^{-\alpha}$ (b) $-\alpha$ (c) $e^{1-\alpha}$ (d) $e^{1+\alpha}$

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286. The value of $\lim_{x \to 2} \frac{2^x + 2^{3-x} - 6}{\sqrt{2^{-x}} - 2^{1-x}}$ is

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287. If $\lim(n \to \infty) \frac{n \cdot 3^n}{n(x-2)^n + n \cdot 3^{n+1} - 3^n} = \frac{1}{3}$ then the range of x is (where $n\varepsilon N$)

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288. If $(\lim)_{x \to a}[f(x)g(x)]$ exists, then both $(\lim)_{x \to a} f(x) and (\lim)_{x \to a} g(x)$ exist.

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289. If $f(x) = \lim_{n \to \infty} n\left(x^{\frac{1}{n}} - 1\right), thenf$ or $x > 0, y > 0, f(xy)$ is equal to : $f(x)f(y)$ (b) $f(x) + f(y)$ $f(x) - f(y)$ (d) none of these

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

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291. $(\lim)_{x \to 1}\left[\cos ec\frac{\pi x}{2}\right]^{\frac{1}{(1-x)}}(where[.]representsthe\ g\ \text{ if }\ isequal \to$

(a) 0 (b) 1 (c) ∞ (d) does not exist

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292. Given $(\lim)_{x \to 0}\frac{f(x)}{x^2} = 2, where[.]$ denotes the greatest integer function, then $(\lim)_{x \to 0}[f(x)] = 0$ $(\lim)_{x \to 0}[f(x)] = 1$ $(\lim)_{x \to 0}\left[\frac{f(x)}{x}\right]$ does not exist $(\lim)_{x \to 0}\left[\frac{f(x)}{x}\right]$ exists

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293. Let $f(x)=\frac{x^2-9x+20}{x-[x]}$ (where $[x]$ is the greatest integer not greater than x. Then $(\lim)_{x\vec{5}} f(x)=1$ $(\lim)_{x\vec{5}} f(x)=0$ $(\lim)_{x\vec{5}} f(x) does \neg e\xi st$ none of these

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294. Use formula $\lim_{x\to 0}\frac{a^x-1}{x}=\log(a)$ to find $\lim_{x\to 0}\frac{2^x-1}{(1+x)^{\frac{1}{2}}-1}$

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295. Find $(\lim)_{x\vec{0}}\left\{\tan\left(\frac{\pi}{4}+x\right)\right\}^{1/x}$

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296. $f(x)$ is the integral of $\frac{2\sin x-\sin 2x}{x^3}, x\neq 0.$ Find $\lim_{x\to 0} f'(x)\left[where f'(x)=\frac{df}{dx}\right]$

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297. Evaluate $\lim_{h \to 0} \frac{(a+h)^2 \sin(a+h) - a^2 \sin a}{h}$.

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298. $\lim_{x \to \infty} \left(x \frac{\log(x)^3}{1+x+x^2} \right.$ equals 0 (b) -1 (c) 1 (d) none of these

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299. $(\lim)_{x \to 0} \frac{(2^m + x)^{\frac{1}{m}} - (2^n + x)^{\frac{1}{n}}}{\xi} sequa < o \quad \frac{1}{m2^m} - \frac{1}{n2^n}$ (b) $\frac{1}{m2^m} + \frac{1}{n2^n} \quad \frac{1}{m2^{-m}} - \frac{1}{n2^{-n}}$ (d) $\frac{1}{m2^{-m}} + \frac{1}{n2^{-n}}$

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300. $(\lim)_{x \to 1} (1-x) \frac{\tan(\pi x)}{2} =_{-} \,-_{-}$

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301. If $f(x) = \begin{cases} \sin x & x \neq n\pi \text{ and } n \in I_2 \\ 2 & x = n\pi \end{cases}$ and $g(x) = \begin{cases} x^2 + 1 & x \neq 0 \\ 4 & x = 0 \\ 5 & x = 2 \end{cases}$ then $\lim_{x \to 0} g\{f(x)\}$ is

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302. $(\lim)_{x \to 0} \left[\min \left(y^2 - 4y + 11\right) \frac{\sin x}{x} \right] (where[.]de \neg esthe$ greatest integer function is 5 (b) 6 (c) 7 (d) does not exist

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303. $\lim_{x \to \pi/2} \frac{\sin(x \cos x)}{\cos(x \sin x)}$ is equal to

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304. If $\lim_{x\to 0}\left(x^{-3}\sin 3x + ax^{-2} + b\right)$ exists and is equal to 0, then (a) $a = -3$ and $b = \frac{9}{2}$ (b) $a = 3$ and $b = \frac{9}{2}$ (c) $a = -3$ and $b = -\frac{9}{2}$ (d) $a = 3$ and $b = -\frac{9}{2}$

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305. If $\lim_{x\to 0}\frac{x^n \cdot \sin^n x}{x^n - \sin^n x}$ is non-zero finite, then n must be equal to 4 (b) 1 (c) 2 (d) 3

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306. $(\lim)_{x \overset{\rightarrow}{} 1}\frac{(1-x)\left(1-x^2\right)\left(1-x^{2n}\right)}{\left\{(1-x)(1-x^2)(1-x^n)\right\}^2}, n \in N, equals \quad \hat{} \ 2nP_n$ (b) $\hat{} \ 2nC_n$ (c) $(2n)!$ (d) none of these

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307. The value of $\lim_{x \to 0}\left(\left[\frac{100x}{\sin x}\right]+\left[\frac{99 \sin x}{x}\right]\right)$ (where [.] represents the greatest integral function) is (a)199 (b) 198 (c)0 (d) none of these

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308. The value of $(\lim)_{x \xrightarrow{} \frac{1}{\sqrt{2}}}\left(x-\cos\frac{\sin^{-1}x}{1-\tan\left(\sin^{-1}x\right)}\right.$ is $-\frac{1}{\sqrt{2}}$ (b) $\frac{1}{\sqrt{2}}$ (c) $\sqrt{2}$ (d) $-\sqrt{2}$

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309. The value of $\lim_{x \to \infty}\frac{\left(2^{x^n}\right)^{\frac{1}{e^x}}-\left(3^{x^n}\right)^{\frac{1}{e^x}}}{x^n}$ (where $n \in N$) is (a) $\log n\left(\frac{2}{3}\right)$ (b) 0 (c) $n \log n\left(\frac{2}{3}\right)$ (d) none of defined

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310. Let $\lim_{x \to 0} \frac{[x]^2}{x^2} = l$ and $\lim_{x \to 0} \frac{[x^2]}{x^2} = m,$ where $[.]$ denotes greatest integer. Then (a)l exists but m does not (b)m exists but l does not (c)both l and m exist (d) neither $\ln$ or m exists

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311. $(\lim)_{x \vec{1}} \frac{x \sin(x - [x])}{x - 1}, where[.]$ denotes the greatest integer function is equal to 0 (b) -1 (c) non-existent (d) none of these

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312. $(\lim)_{x \vec{0}} \left[\frac{\sin(sgn(x))}{(sgn(x))}\right],$ where$[.]$ denotes the greatest integer function, is equal to 0 (b) 1 (c) -1 (d) does not exist

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313. $\lim_{x \to 0} \frac{2 + 2x + \sin 2x}{(2x + \sin 2x)e^{\sin x}}$ is

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314. If $f(x)=\frac{\cos x}{(1-\sin x)^{\frac{1}{3}}}$ then (a) $(\lim)_{x\to\frac{\pi}{2}} f(x)=-\infty$ (b) $(\lim)_{x\to\frac{\pi}{2}} f(x)=\infty$ (c) $(\lim)_{x\to\frac{\pi}{2}} f(x)=\infty$ (d) none of these

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315. $\lim_{x\to-\infty}\frac{x^2\cdot\tan\left(\frac{1}{x}\right)}{\sqrt{8x^2+7x+1}}$ is

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316. T_1 is an isosceles triangle in circle C. Let T_2 be another Ãsosceles triangle inscribed in C whose base is one of the equal sides of T_1 and which overlaps the interior of T_1. Similarly, create isosceles triangle T_3 from T_2; T_4 and T_5, and so on. Prove that the triangle T_n, approaches an equilateral triangle as $n\to\infty$,

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317. If $f(x)=0$ is a quadratic equation such that $f(-\pi)=f(\pi)=0$ and $f\left(\frac{\pi}{2}\right)=-\frac{3\pi^2}{4}$, then $\lim_{x\to-\pi}\frac{f(x)}{\sin(\sin x)}$ is equal to (a)0 (b) π (c) 2π (d) none of these

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318. $(\lim)_{x\overrightarrow{\infty}}\left[\left(\frac{e}{1-e}\right)\left(\frac{1}{e}-\frac{x}{1+x}\right)\right]^{\xi}s$ $e^{(1-e)}$ (b) $e^{\left(\frac{1-e}{e}\right)}$ (c) $e^{\left(\frac{e}{1-e}\right)}$ (d) $e^{\left(\frac{1+e}{e}\right)}$

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319. $\lim_{x\to0}\left(\frac{1+\tan x}{1+\sin x}\right)^{\cos ecx}$ is equal to

A. e

B. $\frac{1}{e}$

C. 1

D. none of these

Answer: C

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320. $(\lim)_{x \to \infty} \frac{\sin^4 x - \sin^2 x + 1}{\cos^4 x - \cos^2 x + 1}$ is equal to (a) 0 (b) 1 (c) $\frac{1}{3}$ (d) $\frac{1}{2}$

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