

1.  $\lim_{x \rightarrow 0} \left( \frac{\sin x - x + \frac{x^3}{6}}{x^5} \right)$
2.  $\lim_{x \rightarrow 0} \left( \frac{1}{x^2} - \cot x \right)$
3.  $\lim_{x \rightarrow 0} \frac{x \cos x - \log(1+x)}{x^2}$
4.  $\lim_{x \rightarrow 0} \frac{1 + \sin x - \cos x + \log(1-x)}{x^3}$
5.  $\lim_{x \rightarrow 0} \left\{ \frac{\log_e(1+x)}{x^2} + \frac{x-1}{x} \right\}$
6.  $\lim_{h \rightarrow 0} \frac{\ln(1+2h) - 2 \ln(1+h)}{h^2}$
7. Find a, b and c such that  $\lim_{x \rightarrow 0} \frac{axe^x - b \log(1+x) + cxe^{-x}}{x^2 \sin x} = 2$
8.  $\lim_{x \rightarrow 0} \frac{x(1+a \cos x) - b \sin x}{x^3} = 1$  the values of a, b for which finite limit exists:  
 (A)  $a = -\frac{5}{2}, b = -\frac{3}{2}$  (B)  $a = -\frac{4}{3}, b = \frac{3}{5}$  (C)  $a = -\frac{5}{3}, b = \frac{4}{7}$  (D) N.O.T
9.  $\lim_{x \rightarrow 0} \frac{\sin 3x + a \sin 2x + b \sin x}{x^5}$  the values of a, b for which finite limit exists & limit is:  
 (A)  $a = -4, b = 2$  & limit is  $-\frac{1}{3}$  (B)  $a = -4, b = 5$  & limit is 1  
 (C)  $a = -5, b = 4$  & limit is  $\frac{1}{3}$  (D) N.O.T
10.  $\lim_{x \rightarrow 0} \frac{\cos 4x + a \cos 2x + b}{x^3}$  the values of a, b for which finite limit exists:  
 (A)  $a = -4$  (B)  $b = 3$  (C)  $a + b = -1$  (D) N.O.T
11.  $\lim_{x \rightarrow 0} \frac{\sin x + ae^x + be^{-x} + c \ln(1+x)}{x^3}$  the values of a, b, c for which finite limit exists & limit is :  
 (A)  $a = -\frac{1}{2}$  (B)  $b = \frac{1}{2}$  (C)  $c = 2$  (D) limit is  $-\frac{1}{3}$
12.  $\lim_{x \rightarrow 0} \frac{x^n - \sin^n x}{x - \sin^n x}$  is non zero finite then find the value of n? Where n is a natural no.
13.  $\lim_{x \rightarrow 0} \frac{10^x - 2^x - 5^x + 1}{x \tan x}$

14.  $\lim_{x \rightarrow 0} \frac{\sum_{t=2}^{2006} t^x - 2005}{x} =$   
 (A)  $\log 2005$  (B)  $\log 2006$  (C)  $\log 2006!$  (D)  $\log 2005!$
15.  $\lim_{x \rightarrow 0} \frac{e^{\tan x} - e^x}{\tan x - x}$
16.  $\lim_{x \rightarrow 2} \frac{\sin(e^{x-2} - 1)}{\log(x - 1)}$
17.  $\lim_{x \rightarrow 2} \frac{x^3 - 7x^2 + 16x - 12}{\log(x - 1) \sin(x - 2)}$
18.  $\lim_{x \rightarrow 2} \frac{2^x + 2^{3-x} - 6}{\sqrt{2^{-x}} - 2^{1-x}}$
19.  $\lim_{x \rightarrow 1} \left[ \sec\left(\frac{\pi x}{2}\right) \log x \right]$
20.  $\lim_{x \rightarrow 0} \left( 1 - \frac{1}{2^x} \right) \left( \frac{1}{\sqrt{\tan x + 4} - 2} \right)$
21.  $\lim_{x \rightarrow 0} \frac{e^{\sin x} - (1 + \sin x)}{(\tan^{-1}(\sin x))^2}$
22. If  $L = \lim_{x \rightarrow 0} \left( \frac{1}{\ln(1+x)} - \frac{1}{\ln(x + \sqrt{1+x^2})} \right)$  then find the value of  $\frac{L+153}{L}$ .
23.  $\lim_{x \rightarrow 4} \frac{(\cos \alpha)^x - (\sin \alpha)^x - \cos 2\alpha}{x - 4}, \alpha \in (0, \pi/2)$
24. If  $\lim_{x \rightarrow 0} \frac{x^3}{\sqrt{a+x}(bx - \sin x)} = 1, a > 0$ , then  $a + 2b$  is equal to  
 (A) 36 (B) 37 (C) 38 (D) 40
25.  $\lim_{x \rightarrow 0} \frac{\sin x^4 - x^4 \cos x^4 + x^{20}}{x^4(e^{2x^4} - 1 - 2x^4)}$  is equal to  
 (A) 0 (B)  $-\frac{1}{6}$  (C)  $\frac{1}{6}$  (D) does not exist

### Answer key

1.  $\frac{1}{120}$  2.  $-\infty$  3.  $\frac{1}{2}$  4.  $-\frac{1}{2}$  5.  $\frac{1}{2}$  6. -1 7.  $a = 3, b = 12,$   
 $c = 9$
8. a 9. b 10. a 11. abcd 12. 1 13.  $(\log 2)(\log 5)$
14. c 15. 1 16. 1 17. -1 18. 8 19.  $-\frac{2}{\pi}$  20.  $\log 16$
21.  $\frac{1}{2}$  22. 307 23.  $(\cos \alpha)^4 \cdot \log(\cos \alpha) - (\sin \alpha)^4 \cdot \log(\sin \alpha)$  24. c 25. c