MATHS

BOOKS - MODERN PUBLICATION

LIMITS AND DERIVATIVES

Example

1. Consider the constant function f (x) = 2. To find the limit of f (x) as $x \to 3$.

Watch Video Solution

2. Consider the function f (x) = sin x. To evaluate $\lim_{x \to \frac{\pi}{2}}$ sin x,where the angle is measured in radians.

Watch Video Solution

3. Consider the function $f(x) = \frac{1}{x^2}$ for x > 0. To find $\lim_{x \to 0} f(x)$.

Watch Video Solution

4. Consider the function :

$$f(x) = \begin{cases} x - 2 & x < 0 \\ 0 & x = 0 \\ x + 2 & x > 0 \end{cases}$$. To find $\lim_{x \to 0} f(x)$.

Watch Video Solution

5. Consider the function :

$$f(x) = \begin{cases} x + 2 & x \neq 1 \\ 0 & x = 1 \end{cases}$$. To find $\lim_{x \to 1} f(x)$.

Watch Video Solution

6. Evaluate left-handed limit of the function:

$$f(x) = \begin{cases} \frac{|x-3|}{x-3} & x \neq 3 \\ 0 & x = 3 \end{cases}$$ at x= 3.

Watch Video Solution

7. Evaluate right-handed limit of the function:

$$f(x) = \begin{cases} \frac{|x-3|}{x-3} & x \neq 3 \\ 0 & x = 3 \end{cases}$$ at x= 3.

Watch Video Solution

8. Evaluate the following by the Method of Direct Substitution :

$$\lim_{x \to 3} (x + 3) .$$

Watch Video Solution

9. Evaluate the following by the Method of Direct Substitution :

$$\lim_{x \to 4} \frac{4x + 3}{x - 2} .$$

Watch Video Solution

10. Evaluate the following by the Method of Direct Substitution :

$$\lim_{x \to -1} \frac{x^{10} + x^5 + 1}{x - 1}.$$

Watch Video Solution

11. Evaluate the following by the Method of Direct Substitution :

$$\lim_{x \to 1} \frac{ax^2 + bx + c}{cx^2 + bx + a}, a + b + c \neq 0.$$

Watch Video Solution

12. Evaluate the following limits by the Method of Factors :

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

Watch Video Solution

13. Evaluate the following limits by the Method of Factors :

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

Watch Video Solution

14. Evaluate the following limits by the Method of Factors :

$$\lim_{x \to 1} \left[\frac{(1-x)^{-1/3}}{(1-x)^{-2/3}} \right].$$

Watch Video Solution

15. Evaluate : $\lim_{x \to 2} \frac{x^{10} - 1024}{x^5 - 32}$, by using Formula.

Watch Video Solution

16. If $\lim_{x \to 3} \frac{x^n - 3^n}{x - 3} = 108$, and $n \in N$, find n.

Watch Video Solution

17. Find all possible values of 'a' if $\lim_{x \to a} \frac{x^9 - a^9}{x - a} = 9.$

Watch Video Solution

18. Evaluate $\lim_{h \to 0} \frac{\sqrt{x + h} - \sqrt{x}}{h}$

Watch Video Solution

19. Evaluate : $\lim_{h \to 0} \frac{1}{h}\left(\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}\right)$ by Method of Rationalisation.

Watch Video Solution

20. Evaluate : $\lim_{x \to 0} \frac{(1+x)^4 - 1}{x}$.

Watch Video Solution

21. If 'f' is an odd function and if $\lim_{x \to 0} f(x)$ exists, prove that this limit must be zero.

Watch Video Solution

22. If 'f' is an even function, prove that $\lim_{x \to 0^-} f(x) = \lim_{x \to 0^+} f(x)$.

Watch Video Solution

23. Find $\lim_{x \to 1} f(x)$, where $f(x) = \begin{cases} x^2 - 1 & x \leq 1 \\ -x^2 - 1 & x > 1 \end{cases}$

Watch Video Solution

24. Let $a_1, a_2, \ldots\ldots, a_n$ be fixed real numbers and define a function $f(x) = (x - a_1)(x - a_2)\ldots\ldots(x - a_n)$. What is $\lim_{x \to a_1} f(x)$? For some $a \neq a_1, a_2, \ldots\ldots\ldots a_n$, compute $\lim_{x \to a} f(x)$.

Watch Video Solution

25. Suppose f(x) = $\begin{cases} a+bx & x<1 \\ 4 & x=1 \\ b-ax & x>1 \end{cases}$ and if $\lim_{x \to 1} f(x) = f(1)$, what are possible values of a and b?

Watch Video Solution

26. Evaluate : $\lim_{x \to 0} \frac{\sin 5x}{\tan 3x}$.

Watch Video Solution

27. Evaluate : $\lim_{x \to 0} \frac{\sin ax}{\sin bx}, a, b \neq 0$.

Watch Video Solution

28. Evaluate : $\lim_{x \to 0} \frac{\sin 3x + 7x}{4x + \sin 2x}$.

Watch Video Solution

29. Evaluate : $\lim_{x \to 0} \frac{\sin x - 2\sin 3x + \sin 5x}{x}$.

Watch Video Solution

30. Evaluate : $\lim_{x \to 0} \frac{\cos ecx - \cot x}{x}$.

Watch Video Solution

31. Evaluate : $\lim_{x \to 0} \frac{1 - \cos 3x}{x^2}$.

Watch Video Solution

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

Watch Video Solution

33. Evaluate : $\lim_{x \to \frac{\pi}{4}} \frac{\sec^2 x - 2}{\tan x - 1}$.

Watch Video Solution

34. Evaluate : $\lim_{x \to 0} \frac{1 - \cos x \cos 2x \cos 3x}{\sin^2 2x}$.

Watch Video Solution

35. Evaluate :

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

.

Watch Video Solution

36. Compute $\lim_{x \to 0} \frac{3^x - 2^x}{x}$.

Watch Video Solution

37. Evaluate : $\lim_{x \to 0} \frac{a^x - 1}{b^x - 1}$.

Watch Video Solution

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

Watch Video Solution

39. Evaluate : $\lim_{x \to 0} \frac{e^{3x} - e^{2x}}{x}$.

Watch Video Solution

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

Watch Video Solution

41. Evaluate : $\lim_{x \to 0} \frac{e^x + e^{-x} - 2}{x^2}$.

Watch Video Solution

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

Watch Video Solution

43. Evaluate : $\lim_{x \to 0} \frac{1 - \cos x\sqrt{\cos 2x}}{x^2}$.

Watch Video Solution

44. Evaluate : $\lim_{x \to 0} \frac{\log(1 + x)}{x}$.

Watch Video Solution

45. Prove that $\lim_{x \to 0} \frac{\log(1 + x^3)}{\sin^3 x} = 1.$

Watch Video Solution

46. Evaluate : $\lim_{x \to 0} \frac{e^x - 1}{\sqrt{1 - \cos x}}$.

Watch Video Solution

47. Find the derivative of f (x) = 10x.

Watch Video Solution

48. Find the derivative of f (x)=3 at x=0 and x=3.

Watch Video Solution

49. If 'f' is defined by $f(x) = x^2$, find f' (2).

Watch Video Solution

50. If for the function 'f', given by : $f(x) = kx^2 + 7x + 4, f'(5) = 97$, find k.

Watch Video Solution

51. Find the derivative of the function : $f(x) = 2x^2 + 3x - 5$ at x=- 1. Also prove that f'(0)+3f' (-1) =0 .

Watch Video Solution

52. Given $f(x) = 2x^3$, find f'(x) by delta method.

Watch Video Solution

53. Given $f(x) = \frac{1}{\sqrt{x}}$, x > 0, find f'(x) by delta method.

Watch Video Solution

54. Find the derivatives of the following function :

f (x) =7.

Watch Video Solution

55. Find the derivatives of the following function :

$f(x) = 8x^4$.

Watch Video Solution

Watch Video Solution

56. For the following function , evaluate the derivative at the indicated value (s) :

$s = 4.9t^2, t = 1, t = 5$.

Watch Video Solution

57. For the following function , evaluate the derivative at the indicated value (s) :

$g(x) = 4x^8, x = -\frac{1}{2}, x = \frac{1}{2}$.

Watch Video Solution

58. Given : $V = \frac{4}{3}\pi r^3$, find $\frac{dV}{dr}$ and hence $\left[\frac{dV}{dr}\right]_{r=2}$.

Watch Video Solution

59. Find $\frac{dy}{dx}$ when : $y = 6x^{100} - x^{55} + x$.

Watch Video Solution

60. Find $\frac{dy}{dx}$ when : $y = \frac{x^8}{8} - \frac{x^6}{6} + \frac{x^4}{4} - 2$.

Watch Video Solution

Watch Video Solution

61. Find the derivative of $f(x) = 1 + x + x^2 + x^3 \ldots\ldots + x^{50}$ at x=1.

Watch Video Solution

62. For the function $f(x) = \frac{x^{100}}{100} + \frac{x^{99}}{99} + \ldots. + \frac{x^2}{2} + x + 1$

Prove that f'(1) =100 f'(0).

Watch Video Solution

63. Find the derivatives of the following :

$f(x) = \left(x^3 - 3x^2 + 4\right)\left(4x^5 + x^2 - 1\right).$

Watch Video Solution

64. Find the derivative of :

$g(x) = x(x - 3)\left(x^2 + x\right).$

Watch Video Solution

65. Find the derivatives of the following :

$g(x) = \dfrac{3x^2 - 2}{x^2 + 7}.$

Watch Video Solution

66. Find the derivatives of the following :

$$f(x) = \frac{3x + 2}{(x + 5)(2x + 1) + 3}.$$

Watch Video Solution

67. It is known for $n \neq 1$ that :

$$1 + x + x^2 + \ldots\ldots\ldots + x^{n-1} = \frac{1 - x^n}{1 - x},$$

hence find the sum of the series:

$$1 + 2x + 3x^2 + \ldots.. + (n - 1)x^{n-2}.$$

Watch Video Solution

Watch Video Solution

68. Use delta method to find the derivates of the following : cos 3x.


Watch Video Solution

69. Use delta method to find the derivatives of the following :

cot (2x + 1).


Watch Video Solution

70. Use delta method to find the derivative of x sin x.

Watch Video Solution

71. Find the derivatives of the following :

$x^3 \sin x + 2x \cos x - 2x \sin x.$

Watch Video Solution

72. Find the derivatives of the following :

$$\frac{\sec x + \tan x}{\sec x - \tan x}.$$

Watch Video Solution

73. Find the derivatives of the following :

$$\frac{1-\cos x}{1+\cos x}.$$

Watch Video Solution

74. Find the derivatives of the following :

$$\frac{\sec x-1}{\sec x+1}.$$

Watch Video Solution

75. Evaluate the derivative of the following function at indicated points : $\frac{1-\sin x}{1+\cos x}, x=\frac{\pi}{2}$.

Watch Video Solution

Exercise

1. Evaluate the following limit if they exist :

$\lim_{x \to 2} 4.$

Watch Video Solution

2. Evaluate the following limit if they exist :

$$\lim_{r \to 1} \pi r^2 .$$

Watch Video Solution

3. Evaluate the given limit : $\lim_{x \to \pi} \left(x - \frac{22}{7} \right)$

Watch Video Solution

4. Evaluate the following limit if they exist :

$$\lim_{x \to 2} (3 - x) .$$

Watch Video Solution

Watch Video Solution

5. Evaluate the following limit if they exist :

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

Watch Video Solution

6. Evaluate the following limit if they exist :

$$\lim_{x \to 3} \left(x(x+1)\right) .$$

Watch Video Solution

7. Evaluate the following limit if they exist :

$$\lim_{x \to 0} \frac{3x + 1}{x + 3} .$$

Watch Video Solution

8. Evaluate the following limit if they exist :

$$\lim_{x \to 0} \frac{ax + b}{cx + 1} .$$

Watch Video Solution

9. Evaluate the following limit if they exist :

$$\lim_{x \to 1} \frac{x^2 + 1}{x + 100} .$$

Watch Video Solution

10. Evaluate the following limit if they exist :

$$\lim_{x \to 3} \frac{x^2 - 4x}{x - 2} .$$

Watch Video Solution

11. Evaluate the following limit if they exist :

$$\lim_{x \to 2} \frac{x^3 - 4x^2 + 4x}{x^2 - 4} .$$

Watch Video Solution

12. Evaluate the following limit if they exist :

$$\lim_{x \to 2} \frac{x^2 - 4}{x^3 - 4x^2 + 4x} .$$

Watch Video Solution

13. Evaluate the following limit if they exist :

$$\lim_{x \to -1} \frac{x^3 - 3x + 1}{x - 1}.$$

Watch Video Solution

14. Evaluate the following limit if they exist :

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

Watch Video Solution

15. Evaluate the following limit if they exist :

$$\lim_{x \to -1} \left[1 + x + x^2 + \ldots . + x^{10}\right].$$

Watch Video Solution

16. Evaluate the following limit :

$$\lim_{x \to 1} \frac{x - 1}{x + 1}.$$

Watch Video Solution

17. Evaluate the following limit :

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

Watch Video Solution

18. Evaluate the following limit :

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

Watch Video Solution

19. Evaluate the following limit :

$$\lim_{x \to 1} \frac{x^3 - 1}{x - 1}.$$

Watch Video Solution

20. Evaluate the following limit :

$$\lim_{x \to 2} \frac{x^3 - 8}{x^2 - 4}.$$

Watch Video Solution

21. Evaluate the following limit :

$$\lim_{x \to 2} \frac{x^3 - 2x^2}{x^2 - 5x + 6}.$$

Watch Video Solution

22. Evaluate the following limit :

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

Watch Video Solution

23. Evaluate the following limit :

$$\lim_{x \to 2} \frac{3x^2 - x - 10}{x^2 - 4}.$$

Watch Video Solution

24. Evaluate the following limit :

$$\lim_{x \to 5} \frac{x^2 - 9x + 20}{x^2 - 6x + 5}.$$

Watch Video Solution

25. Evaluate the following limit :

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

Watch Video Solution

26. Evaluate the following limit :

$$\lim_{x \to -1} \frac{x^3+1}{x+1}.$$

Watch Video Solution

27. Evaluate the following limit :

$$\lim_{x \to 3} \frac{x^4 - 81}{2x^2 - 5x - 3}.$$

Watch Video Solution

28. If $\lim_{x \to a} \frac{x^9 + a^9}{x + a} = 9$, find the real value of a.

Watch Video Solution

29. Evaluate the left-hand and right-hand limits of the a following function at x =1 :

$$f(x) = \begin{cases} 5x - 4, & \text{if } 0 < x \leq 1 \\ 4x^2 - 3x, & \text{if } 1 < x < 2. \end{cases}$$

Does $\lim_{x \to 1} f(x)$ exist ?

Watch Video Solution

30. Find k so that : $\lim_{x \to 2} f(x)$ exists, where :

$$f(x) = \begin{cases} 2x + 3 & , \text{ if } x \leq 2 \\ x + k & , \text{ if } x > 2. \end{cases}$$

Watch Video Solution

31. Find k so that : $\lim_{x \to 2} f(x)$ exists, where :

$$f(x) = \begin{cases} 2x + 3 & , \text{ if } x \leq 2 \\ x + 2k & , \text{ if } x > 2. \end{cases}$$

Watch Video Solution

32. Find k so that : $\lim_{x \to 2} f(x)$ exists, where :

$$f(x) = \begin{cases} 2x + 3 & , \text{ if } x \leq 2 \\ x + 3k & , \text{ if } x > 2. \end{cases}$$

Watch Video Solution

33. Evaluate the following limit :

$$\lim_{x \to 1} \frac{x^{15} - 1}{x^{10} - 1}.$$

Watch Video Solution

34. Evaluate the following limit :

$$\lim_{x \to 0} \frac{(x+1)^5 - 1}{x}.$$

Watch Video Solution

35. Prove that $\lim_{x \to 0} \frac{(1+x)^n - 1}{x} = n$.

Watch Video Solution

36. If $\lim_{x \to 2} \frac{x^n - 2^n}{x - 2} = 80$ and if n is a positive integer, find n.

Watch Video Solution

37. Evaluate the following limit :

$$\lim_{x \to 3} \frac{x^3 - 7x^2 + 15x - 9}{x^4 - 5x^3 + 27x - 27}.$$

Watch Video Solution

38. Evaluate the following limit :

$$\lim_{x \to \sqrt{2}} \frac{x^9 - 3x^8 + x^6 - 9x^4 - 4x^2 - 16x + 84}{x^5 - 3x^4 - 4x + 12}$$

.

Watch Video Solution

39. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{x}$$

.

Watch Video Solution

40. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{2x}.$$

Watch Video Solution

41. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\sqrt{2-x} - \sqrt{2+x}}{x}.$$

Watch Video Solution

42. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\sqrt{1+3x} - \sqrt{1-3x}}{x}.$$

Watch Video Solution

43. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\sqrt{1+x} - 1}{x}.$$

Watch Video Solution

44. Evaluate the following limit :

$$\lim_{x \to 2} \frac{2 - x}{\sqrt{2 + x} - 2}.$$

Watch Video Solution

45. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\sqrt{x + 2} - \sqrt{2}}{x}.$$

Watch Video Solution

46. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\sqrt{1-x^2} - \sqrt{1+x^2}}{2x^2}.$$

Watch Video Solution

47. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\sqrt{a^2+x^2} - \sqrt{a^2-x^2}}{x^2}.$$

Watch Video Solution

48. Evaluate the following limit :

$$\lim_{h \to 0} \frac{1}{h}\left[\frac{1}{x+h} - \frac{1}{x}\right].$$

Watch Video Solution

49. Evaluate the following limit :

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

Watch Video Solution

50. Find all possible values of a, if :

$$\lim_{x \to a} \frac{x^9 - a^9}{x - a} = \lim_{x \to 5} (4 + x) .$$

Watch Video Solution

51. Find all possible values of a, if :

$$\lim_{x \to a} \frac{x^3 - a^3}{x - a} = \lim_{x \to 1} \frac{x^4 - 1}{x - 1} .$$

Watch Video Solution

52. Evaluate $\lim_{z \to 1} \frac{z^{1/3} - 1}{z^{1/6} - 1}$

Watch Video Solution

53. Prove that : $\lim_{x \to 0} \frac{|x|}{x}$ does not exist.

Watch Video Solution

54. Prove that : $\lim_{x \to 0} \frac{x}{|x|}$ does not exist.

Watch Video Solution

55. Prove that : $\lim_{x \to 0^+} \frac{x}{|x|} = 1$.

Watch Video Solution

56. Prove that : $\lim_{x \to 0^-} \frac{x}{|x|} = -1$.

Watch Video Solution

57. If the function f (x) satisfies $\lim_{x \to 1} \frac{f(x) - 2}{x^2 - 1} = \pi$, evaluate $\lim_{x \to 1} f(x)$.

Watch Video Solution

58. Find $\lim_{x \to 0} f(x)$, and $\lim_{x \to 1} f(x)$, where :

$$f(x) = \begin{cases} 2x + 3 & , \quad x \leq 0 \\ 3(x + 1) & , \quad x > 0. \end{cases}$$

Watch Video Solution

59. Find $\lim_{x \to 0} f(x)$, where f (x) =|x|-5.

Watch Video Solution

60. Find $\lim_{x \to 0} f(x)$, where

$$f(x) = \begin{cases} \frac{|x|}{x} & x \neq 0 \\ 0 & x = 0 \end{cases}$$

Watch Video Solution

61. Find $\lim_{x \to 0} f(x)$, where

$$f(x) = \begin{cases} \frac{|x|}{x} & x \neq 0 \\ 0 & x = 0 \end{cases}$$

Watch Video Solution

62. Let $f(x) = \begin{cases} |x| + 1 & , \quad x < 0 \\ 0 & , \quad x = 0 \\ |x| - 1 & , \quad x > 0. \end{cases}$ For what value(s) of 'a' does $\lim_{x \to a} f(x)$ exist ?

Watch Video Solution

63. If f(x)= $\begin{matrix} mx^2+n & x<0 \\ nx+m & 0\le x\le 1 \\ nx^3+m & x>1 \end{matrix}$ For what integers m and n does both $\lim_{x\to 0} f(x)$ and $\lim_{x\to 1} f(x)$ exist

Watch Video Solution

64. Evaluate the following :

$$\lim_{x\to 0} \frac{\cos x}{\pi - x}.$$

Watch Video Solution

65. Evaluate the following :

$$\lim_{\theta \to 0} \frac{1 - \cos \theta}{2\theta^2} .$$

Watch Video Solution

66. Evaluate the following :

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

Watch Video Solution

67. Evaluate the following :

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

Watch Video Solution

68. Evaluate the following :

$$\lim_{x \to 0} \frac{1 - \cos 2x}{3x^2} .$$

Watch Video Solution

69. Evaluate the following :

$$\lim_{\theta \to 0} \frac{1 - \cos 4\theta}{1 - \cos 6\theta}.$$

Watch Video Solution

70. Evaluate the following :

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

Watch Video Solution

71. Evaluate the following :

$\lim_{x \to 0} \frac{1 - \cos mx}{1 - \cos nx}$, m, n being fixed non-zero real numbers.

Watch Video Solution

72. Evaluate the following :

$\lim_{x \to 0} \frac{1 - \cos 5x}{1 - \cos 6x}$.

Watch Video Solution

73. Evaluate the following :

$$\lim_{\theta \to 0} \frac{1 - \cos \theta}{1 - \cos 3\theta} .$$

Watch Video Solution

74. Evaluate the following :

$$\lim_{x \to 0} \frac{1 - \cos^2 x}{3 \tan^2 x} .$$

Watch Video Solution

75. Evaluate the following :

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

Watch Video Solution

76. Evaluate the following :

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

Watch Video Solution

77. Evaluate the following :

$$\lim_{x \to 0} \left(\frac{3 \sin x - \sin 3x}{x^3} \right).$$

Watch Video Solution

78. Evaluate the following :

$$\lim_{x \to 0} \frac{\sin x}{x}.$$

Watch Video Solution

79. Evaluate the following :

$$\lim_{x \to 0} \frac{\sin ax}{bx} .$$

Watch Video Solution

80. Evaluate the following :

$$\lim_{x \to 0} \frac{x}{\tan x} .$$

Watch Video Solution

81. Evaluate the following :

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

Watch Video Solution

82. Evaluate the following :

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

Watch Video Solution

83. Evaluate the following :

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

Watch Video Solution

84. Evaluate the following :

$$\lim_{x \to 0} \frac{\sin 4x}{\sin 2x} .$$

Watch Video Solution

85. Evaluate the following :

$$\lim_{x \to 0} \frac{\sin(\pi - x)}{\pi(\pi - x)} .$$

Watch Video Solution

86. Evaluate the following :

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

Watch Video Solution

87. Evaluate the following :

$$\lim_{\theta \to 0} \frac{\sin 3\theta}{\tan 2\theta} .$$

Watch Video Solution

88. Evaluate the following :

$$\lim_{\theta \to 0} \frac{\sin 4\theta}{\tan 3\theta} .$$

Watch Video Solution

89. Evaluate the following :

$$\lim_{x \to 0} \frac{\sin 3x}{\sin 7x} .$$

Watch Video Solution

90. Evaluate the following :

$$\lim_{x \to 0} \frac{\tan 2x}{x} .$$

Watch Video Solution

91. Evaluate the following :

$$\lim_{x \to 0} x \cot 2x.$$

Watch Video Solution

92. Evaluate the following :

$$\lim_{x \to 0} x \sec x.$$

Watch Video Solution

93. Evaluate the following :

$$\lim_{x \to \infty} \frac{\cos x}{x} .$$

Watch Video Solution

94. Evaluate the following :

$$\lim_{x \to 0} \frac{ax + x \cos x}{b \sin x} .$$

Watch Video Solution

95. Evaluate the following :

$$\lim_{x \to 0} \frac{x \tan 4x}{1 - \cos 4x} .$$

Watch Video Solution

96. Evaluate the following :

$$\lim_{x \to \pi} \frac{1 + \cos x}{\tan^2 x} .$$

Watch Video Solution

97. Evaluate the following :

$$\lim_{x \to 0} \frac{\sin ax + bx}{ax + \sin bx}, a, b, a + b \neq 0 .$$

Watch Video Solution

98. Evaluate the following :

$$\lim_{x \to 0} \frac{\sin(2 + x) - \sin(2 - x)}{x} .$$

Watch Video Solution

99. Evaluate the following :

$$\lim_{x \to 0} \left(\frac{\cos ax - \cos bx}{x^2} \right).$$

Watch Video Solution

100. Evaluate the following :

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

Watch Video Solution

101. Evaluate the following :

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

Watch Video Solution

102. Evaluate the following :

$$\lim_{x \to \frac{\pi}{4}} \frac{\cos ec^2 x - 2}{\cot x - 1}.$$

Watch Video Solution

103. Evaluate the following limit :

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

Watch Video Solution

104. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\sin 5x - \sin 3x}{\sin x} .$$

Watch Video Solution

105. Evaluate the following limit :

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

Watch Video Solution

106. Evaluate the following limit :

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

Watch Video Solution

107. Evaluate the following limit :

$$\lim_{x \to \frac{\pi}{2}} \frac{\cot x - \cos x}{\cos^3 x} .$$

Watch Video Solution

108. Evaluate the following limit :

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

Watch Video Solution

109. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\sin 2x + 3x}{4x - \sin 5x}.$$

Watch Video Solution

110. Evaluate the following limit :

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

Watch Video Solution

111. Evaluate the following limit :

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

Watch Video Solution

112. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\sin 4x - \tan 4x}{x^3} .$$

Watch Video Solution

113. Evaluate the following limit :

$$\lim_{x \to \pi/2} \frac{\cos^2 x}{1 - \sin x} .$$

Watch Video Solution

114. Evaluate the following limit :

$$\lim_{x \to 0} (\cos ecx - \cot x) .$$

Watch Video Solution

115. Evaluate the following limit :

$$\lim_{y \to 0} \frac{(x+y)\sec(x+y) - x\sec x}{y}.$$

Watch Video Solution

116. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\tan 3x + x}{2x + \sin 4x}.$$

Watch Video Solution

117. Evaluate the following limit :

$$\lim_{x \to 0} \left(\frac{\cos ecx - \cot x}{x} \right).$$

Watch Video Solution

118. Evaluate the following limit :

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

Watch Video Solution

119. Evaluate the following limit :

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

Watch Video Solution

120. Evaluate the following limit :

$$\lim_{x \to \frac{\pi}{2}} \frac{\tan 2x}{x - \frac{\pi}{2}}.$$

Watch Video Solution

121. Evaluate the following limit :

$$\lim_{x \to \pi} \frac{\sin 3x - 3 \sin x}{(\pi - x)^3}.$$

Watch Video Solution

122. Evaluate the following limit :

$$\lim_{x \to \frac{\pi}{2}} \frac{\cot x}{\frac{\pi}{2} - x}.$$

Watch Video Solution

123. Evaluate the following limit :

$$\lim_{x \to \pi/2} \frac{\cos x}{\frac{\pi}{2} - x}.$$

Watch Video Solution

124. Evaluate the following limit :

$$\lim_{x \to \pi} \frac{\sin x}{x - \pi}.$$

Watch Video Solution

125. Evaluate the following limit :

$$\lim_{x \to \pi/4} \frac{\sin x - \cos x}{x - \pi/4}.$$

Watch Video Solution

126. Evaluate the following limit :

$$\lim_{x \to \pi/4} \frac{\sin x - \cos x}{\frac{\pi}{4} - x}.$$

Watch Video Solution

127. Evaluate the following limit :

$$\lim_{t \to 1} \frac{1 - \frac{1}{t}}{\sin[\pi(t-1)]} .$$

Watch Video Solution

128. Evaluate the following limit :

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

Watch Video Solution

129. Let $f(x) = \begin{cases} \cos x & \text{if} \quad x \geq 0 \\ x + k & \text{if} \quad x < 0. \end{cases}$ Find the value of the constant k, given that $\lim_{x \to 0} f(x)$ exists.

Watch Video Solution

130. Evaluate the following limit :

$\lim_{x \to 0} e^x$.

Watch Video Solution

131. Evaluate the following limit :

$$\lim_{x \to -\infty} e^{x} .$$

Watch Video Solution

132. Evaluate the following limit :

$$\lim_{x \to \infty} e^{-x} .$$

Watch Video Solution

133. Evaluate the following limit :

$$\lim_{x \to -\infty} 2^x .$$

Watch Video Solution

134. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^{4x} - 1}{x} .$$

Watch Video Solution

135. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^{3x} - 1}{x}.$$

Watch Video Solution

136. Evaluate the following limit :

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

Watch Video Solution

137. Evaluate the following limit :

$$\lim_{x \to 0} \frac{3^{2+x} - 9}{x}.$$

Watch Video Solution

138. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^{2+x} - e^{2}}{x}.$$

Watch Video Solution

139. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^x - x - 1}{x}.$$

Watch Video Solution

140. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^x - \sin x - 1}{x}.$$

Watch Video Solution

141. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^{3+x} - \sin x - e^3}{x}.$$

Watch Video Solution

142. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^x - e^{\sin x}}{x - \sin x}.$$

Watch Video Solution

143. Evaluate the following limit :

$$\lim_{x \to 5} \frac{e^x - e^5}{x - 5}.$$

Watch Video Solution

144. Evaluate the following limit :

$$\lim_{x \to 2} \frac{e^x - e^2}{x - 2}.$$

Watch Video Solution

145. Evaluate the following limit :

$$\lim_{x \to 3} \frac{e^x - e^3}{x - 3} .$$

Watch Video Solution

146. Evaluate the following limit :

$$\lim_{x \to 0} \frac{a^x - b^x}{x} (a > 0, b > 0) .$$

Watch Video Solution

147. Evaluate the following limit :

$$\lim_{x \to 0} \frac{a^x - a^{-x}}{x} .$$

Watch Video Solution

148. Evaluate the following limit :

$$\lim_{x \to 0} \left(e^x - e^{-x}\right) .$$

Watch Video Solution

149. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^{x} - e^{-x}}{x}.$$

Watch Video Solution

150. Evaluate the following limit :

$$\lim_{x \to 1} \frac{e^{-x} - e^{-1}}{x - 1}.$$

Watch Video Solution

151. Evaluate the following limit :

$$\lim_{x \to 1} \frac{e^x - e^{-x}}{e^x + e^{-x}} .$$

Watch Video Solution

152. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^x - e^{-x}}{\sin x} .$$

Watch Video Solution

153. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^{bx} - e^{ax}}{x} , .$$

Watch Video Solution

154. Evaluate the following limit :

$$\lim_{x \to 1} \frac{\log x}{x - 1} .$$

Watch Video Solution

155. Evaluate the following limit :

$$\lim_{x \to 1} \frac{x - 1}{\log x} .$$

Watch Video Solution

156. Evaluate the following limit :

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

Watch Video Solution

157. Evaluate the following limit :

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

Watch Video Solution

158. Evaluate the following limit :

$$\lim_{x \to 3} \frac{\log x - \log 3}{x - 3}.$$

Watch Video Solution

159. Evaluate the following limit :

$$\lim_{x \to 0} \frac{\log(3+x) - \log(3-x)}{x}.$$

Watch Video Solution

160. Evaluate the following limit :

$$\lim_{x \to \infty} \frac{\sin\left(\frac{a}{2^x}\right)}{\sin\left(\frac{b}{2^x}\right)}.$$

Watch Video Solution

161. Evaluate the following limit :

$$\lim_{x \to 0} \left[\frac{1}{x} - \frac{\log(1+x)}{x^2} \right].$$

Watch Video Solution

162. Evaluate the following limit :

$$\lim_{x \to 2} \frac{3^x + 3^{3-x} - 12}{3^{3-x} - 3^{\frac{x}{2}}}.$$

Watch Video Solution

163. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^{\sin x} - 1}{x}.$$

Watch Video Solution

164. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^{\tan x} - 1}{x}.$$

Watch Video Solution

165. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^{\sin x} - 1}{\sin x}.$$

Watch Video Solution

166. Evaluate the following limit :

$$\lim_{x \to 0} \frac{e^{\tan x} - 1}{\tan x}.$$

Watch Video Solution

167. Evaluate the following limit :

$$\lim_{x \to \frac{\pi}{2}} \frac{e^{\sin x} - 1}{\sin x}.$$

Watch Video Solution

168. Evaluate the following limit :

$$\lim_{x \to \frac{\pi}{2}} \frac{e^{\cos x} - 1}{\cos x}.$$

Watch Video Solution

169. Evaluate the following limit :

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

Watch Video Solution

170. Evaluate the following limit :

$$\lim_{x \to 0} \left(\frac{e^{x} - e^{-x}}{\sin x} \right).$$

Watch Video Solution

171. Evaluate the following limit :

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

Watch Video Solution

172. Evaluate the following limit :

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

Watch Video Solution

173. Evaluate the following limit :

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

Watch Video Solution

174. Evaluate the following limit :

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

Watch Video Solution

175. Evaluate the following limit :

$$\lim_{x \to 0} \frac{2^x - 1}{\sqrt{1+x} - 1}.$$

Watch Video Solution

176. Evaluate the following limit :

$$\lim_{x \to 0} \frac{5^x - 1}{\sqrt{4+x} - 2}.$$

Watch Video Solution

177. Find the derivative at x = 2 of the function f(x) = 3x.

Watch Video Solution

178. Find the derivative of f(x) = sin x at x = 0.

Watch Video Solution

179. If $g(t) = 1 - 4t^2$, find g'(1).

Watch Video Solution

180. If $f(x) = x^2 + 2x + 7$, find f'(3).

Watch Video Solution

181. If $f(x) = x^3 + 7x^2 + 8x - 9$, find f'(4).

Watch Video Solution

182. Find the derivative of f, defined by f (x) =mx +c at x = 0.

Watch Video Solution

183. Find f'(2) and f'(5), where $f(x) = x^2 + 7x + 4$.

Watch Video Solution

184. If $f(x) = x^2 - 19x + 18$, then find f'(2), f'(1) and f' (10), using limit process only once.

Watch Video Solution

185. Show that the derivative of the function f, given by : $f(x) = 2x^3 - 9x^2 + 12x + 9$, at x=1 and x=2 are equal.

Watch Video Solution

186. For the function f, $f(x) = x^2 - 4x + 7$, show that $f'(5) = 2f'\left(\frac{7}{2}\right)$.

Watch Video Solution

187. For the function f, $f(x) = x^2 - 6x + 8$, prove that f’(5)-3 f'(2)= f’(8).

Watch Video Solution

188. Given $f(x) = 2x^3$, find f'(x) by delta method.

Watch Video Solution

189. If $f: R \to R$ and $g: R \to R$ be two mapping such that f(x) = sin x and g(x) = x^2, then find the values of (fog) $\frac{\sqrt{\pi}}{2}$ and $(\text{gof})\left(\frac{\pi}{3}\right)$.

Watch Video Solution

190. If y = 2x, find $\frac{dy}{dx}$ from first principles.

Watch Video Solution

191. If $f(x) = (x-1)^2$, find f' from first principles.

Watch Video Solution

192. If $f(x) = 3x^2 + 5x - 1$, find f'.

Watch Video Solution

193. Let $y = ax^2 + 3$, where 'a' is constant. Find $\frac{dy}{dx}$ by the delta method and find $\left[\frac{dy}{dx}\right]_{x=-1}$.

Watch Video Solution

194. Find, from first principles, the derivative of the following w.r.t. x:

-x.

Watch Video Solution

195. Find, from first principles, the derivative of the following w.r.t. x:

$(-x)^{-1}$.

Watch Video Solution

196. Find, from first principles, the derivative of the following w.r.t. x:

x^3.

Watch Video Solution

197. Find, from first principles, the derivative of the following w.r.t. x:

$\frac{1}{x^2}$.

Watch Video Solution

198. Find, from first principles, the derivative of the following w.r.t. x:

$x^{-\frac{3}{2}}$.

Watch Video Solution

199. Find, from first principles, the derivative of the following w.r.t. x:

$(3x)^{-\frac{3}{2}}$.

Watch Video Solution

200. Find, from first principles, the derivative of the following w.r.t. x:

$\frac{1}{x}, x \neq 0$.

Watch Video Solution

201. Find, from first principles, the derivative of the following w.r.t. x:

$\sqrt{x}$.

Watch Video Solution

202. Find, from first principles, the derivative of the following w.r.t. x:

$$\sqrt{x} + \frac{1}{\sqrt{x}} .$$

Watch Video Solution

203. Differentiate the following by delta method :

$$x^3 - 27.$$

Watch Video Solution

204. Differentiate the following by delta method

:

$(x-1)(x-2)$.

Watch Video Solution

205. Differentiate the following by delta method

:

$(x+1)(x+2)(x+3)$.

Watch Video Solution

206. Differentiate the following from ab-initio (or from definition) :

$$x + \frac{1}{x}(x \neq 0) .$$

Watch Video Solution

207. Differentiate the following from ab-initio (or from definition) :

$$x - \frac{1}{x}(x \neq 0) .$$

Watch Video Solution

208. Differentiate the following from ab-initio (or from definition) :

$$\frac{x-2}{x+3}.$$

Watch Video Solution

209. Differentiate the following from ab-initio (or from definition) :

$$\frac{x+1}{x-1}.$$

Watch Video Solution

210. Differentiate the following from ab-initio (or from definition) :

$$\frac{x^2+1}{x}.$$

Watch Video Solution

211. Differentiate the following from ab-initio (or from definition) :

$$\frac{2x+3}{x-2}.$$

Watch Video Solution

212. Differentiate the following from ab-initio (or from definition) :

$$\frac{x^2-6}{3x}, x \neq 0 .$$

Watch Video Solution

213. Differentiate the following from ab-initio (or from definition) :

$$(x+2)^3 .$$

Watch Video Solution

214. Find the derivatives of the following function :

f (x) =a.

Watch Video Solution

215. Find the derivatives of the following function :

$f(x) = \pi$.

Watch Video Solution

216. Find the derivatives of the following function :

f (x) =x+a.

Watch Video Solution

217. Find the derivatives of the following function :

$f(x) = (ax + b)^n$.

Watch Video Solution

218. Find the derivatives of the following function :

$f(x) = 2x - \frac{3}{4}.$

Watch Video Solution

219. Find the derivatives of the following function :

$f(x) = x^3 + 4x^2 + 3x + 2.$

Watch Video Solution

220. Find the derivatives of the following function :

$y = x^2.$

Watch Video Solution

221. Find the derivatives of the following function :

$y = \frac{5}{2}x^7.$

Watch Video Solution

222. For the following function , evaluate the derivative at the indicated value (s) :

$f(x) = x$, $x=1$.

Watch Video Solution

223. For the following function , evaluate the derivative at the indicated value (s) :

$f(x) = 99x$, $x = 100$.

Watch Video Solution

224. For the following function , evaluate the derivative at the indicated value (s) :

$f(x) = x^2 - 2, x = 10$.

Watch Video Solution

225. For the following function , evaluate the derivative at the indicated value (s) :

f(x) =x , x=1.

Watch Video Solution

226. If $f(x) = x^n$ and if f' (1) = 10, find n.

Watch Video Solution

227. Find a if f' (a) =0, where $f(x) = x^3 - 3x^2 + 3x - 1.$

Watch Video Solution

228. If $f(x) = \alpha x^n$, prove that $\alpha = \frac{f'(1)}{n}$.

Watch Video Solution

229. Prove from first principles, that $\frac{d}{dx}(\alpha x^n) = \alpha n x^{n-1}$.

Watch Video Solution

230. Use the delta method to find the derivative of $f(x) = x^4$ .Hence find $f'\left(-\frac{1}{2}\right)$ and and f'(0).

Watch Video Solution

231. If $y = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots + \frac{x^n}{n!}$, prove that $\frac{dy}{dx} + \frac{x^n}{n!} = y$

Watch Video Solution

232. Find the derivatives of the following function at any point of their domains :

$y = \frac{ax + b}{c}, c \neq 0$.

Watch Video Solution

233. Find the derivatives of the following function at any point of their domains :

$y = \left(x - \frac{1}{x}\right)^2$.

Watch Video Solution

234. Find the derivatives of the following function at any point of their domains :

$y = ax^3 + bx^2 + cx + d$.

Watch Video Solution

235. Find the derivatives of the following function at any point of their domains :

$$y = \frac{1}{7}x^7 + \frac{1}{5}x^5 - \frac{2}{3}x^3 + 5\,.$$

Watch Video Solution

236. Find the derivatives of the following function at any point of their domains :

$$f(x) = x^4 + 7x^3 + 8x^2 + 3x + 2.$$

Watch Video Solution

237. Find the derivatives of the following function at any point of their domains :

$f(x) = 3x^6 - \frac{x^4}{4}.$

Watch Video Solution

238. Find the derivatives of the following function at any point of their domains :

$u = \frac{t^5}{5} - \frac{t^3}{3} + t\,.$

Watch Video Solution

239. Find the derivatives of the following function at any point of their domains :

$G(t) = -2t^{10} + 1 - t^3 + 7t^5$.

Watch Video Solution

240. Let $f(x) = 3x^3 + 7x^5$. Find f' (2).

Watch Video Solution

241. Let $f(x) = \frac{x^3}{3} - \frac{x^2}{2} + x - 16$. Find f'(0), f'(-1).

Watch Video Solution

242. Given $u = 7t^4 - 2t^3 - 8t - 5$, find $\frac{du}{dt}$. Hence, find $\frac{du}{dt}$ at t = 0, 1, 2.

Watch Video Solution

243. Let $H(y) = 2y^4 - 6y^3 + 2y - 4$. Find $H'(2)$.

Watch Video Solution

244. Let $G(u) = 2 - u^3 + \frac{u^5}{5}$. Find $G'(-2)$.

Watch Video Solution

245. If (x) = mx +c and if f(0)=f'(0)=1, what is f(2) ?

Watch Video Solution

246. Find the derivative of

$x^n + ax^{n-1} + a^2x^{n-2} + \ldots\ldots\ldots + a^{n-1}x + a^n$

for some fixed real number a.

Watch Video Solution

247. Find the derivatives of the following :

$$G(x) = \left(\sqrt{2}x^3 + x^5\right)\left(\sqrt{3}x^2 + \frac{1}{5}x^5\right).$$

Watch Video Solution

248. Find the derivatives of the following at any point of their domains :

$$f(x) = (x - a)(x - b).$$

Watch Video Solution

249. Find the derivatives of the following at any point of their domains :

$g(x) = (px + q)\left(\frac{r}{x} + s\right)$.

Watch Video Solution

250. Find the derivatives of the following at any point of their domains :

$H(x) = (ax + b)(cx + d)^2$.

Watch Video Solution

251. Find the derivatives of the following at any point of their domains :

$f(x) = (ax + b)^n (cx + d)^m$.

Watch Video Solution

252. Find the derivatives of the following at any point of their domains :

$f(x) = \left(x^2 - 5x + 6\right)\left(x^3 + 2\right)$.

Watch Video Solution

253. Find the derivatives of the following at any point of their domains :

$G(x) = \left(5x^3 + 3x - 1\right)(x - 1)$.

Watch Video Solution

254. Find the derivatives of the following at any point of their domains :

$f(x) = \left(x^2 + 2\right)^2$.

Watch Video Solution

255. Find the derivatives of the following at any point of their domains :

$f(x) = \left(3x^2 + 2\right)^2$.

Watch Video Solution

256. Find the derivatives of the following at any point of their domains :

$f(x) = (x + 1)^3$.

Watch Video Solution

257. Find the derivatives of the following at any point of their domains :

$$f(x) = \left(x^2 + 2\right)\left(x^3 - 3x^2 + 4\right)\left(x^4 - 1\right).$$

Watch Video Solution

258. Find the derivatives of the following at any point of their domains :

$$f(x) = \frac{1}{x}, x \neq 0.$$

Watch Video Solution

259. Find the derivatives of the following at any point of their domains :

$$f(x) = \frac{1}{\sqrt{3}x^3}, x \neq 0 .$$

Watch Video Solution

260. Find the derivatives of the following at any point of their domains :

$$f(x) = \frac{1}{ax^2 + bx + c} .$$

Watch Video Solution

261. Find the derivatives of the following at any point of their domains :

$$f(x) = \frac{2}{x+1} - \frac{x^2}{3x-1}.$$

Watch Video Solution

262. Find the derivatives of the following at any point of their domains :

$$f(x) = \left(ax^2 + b\right)^2.$$

Watch Video Solution

263. Find the derivatives of the following at any point of their domains :

$$\frac{x+1}{x}.$$

Watch Video Solution

264. Find the derivatives of the following at any point of their domains :

$$f(x) = \frac{x-a}{x-b}.$$

Watch Video Solution

265. Find the derivatives of the following at any point of their domains :

$$f(x) = \frac{ax + b}{cx + d}.$$

Watch Video Solution

266. Find the derivatives of the following at any point of their domains :

$$f(x) = x + \frac{1}{x}.$$

Watch Video Solution

267. Find the derivatives of the following at any point of their domains :

$$g(x) = \frac{1 + \frac{1}{x}}{1 - \frac{1}{x}} .$$

Watch Video Solution

268. Find the derivatives of the following at any point of their domains :

$$f(x) = \frac{px^2 + qx + r}{ax + b} .$$

Watch Video Solution

269. Find the derivatives of the following at any point of their domains :

$$f(x) = \frac{ax + b}{px^2 + qx + r} .$$

Watch Video Solution

270. Find the derivatives of the following at any point of their domains :

$$f(x) = x^{-3}(5 + 3x) .$$

Watch Video Solution

271. Find the derivatives of the following at any point of their domains :

$f(x) = x^5\left(3 - 6x^{-9}\right)$.

Watch Video Solution

272. Find the derivatives of the following at any point of their domains :

$f(x) = x^{-4}\left(3 - 4x^{-5}\right)$.

Watch Video Solution

273. Find the derivatives of the following at any point of their domains :

$$f(x) = \frac{(x+5)\left(2x^2-1\right)}{x}, x \neq 0 .$$

Watch Video Solution

274. Find the derivatives of the following at any point of their domains :

$$H(x) = \frac{(x-1)(x-2)}{(x-3)(x-4)}, x \neq 3, 4.$$

Watch Video Solution

275. Differentiate $\frac{x+2}{x^2-3}$ and find the value of the derivative at x = 0.

Watch Video Solution

276. Find the derivatives of the following :

$\sin(x+a)$.

Watch Video Solution

277. Find the derivatives of the following :

$\sin 2x$.

Watch Video Solution

278. Find the derivatives of the following :

$\sin^2 x$.

Watch Video Solution

279. Find the derivatives of the following :

$\sin x \cos x$.

Watch Video Solution

280. Find the derivatives of the following :

$3 \sin x + 2 \sin \alpha$, where α is a constant.

Watch Video Solution

281. Find the derivatives of the following :

$$\frac{a}{x^4} - \frac{b}{x^2} + \cos x.$$

Watch Video Solution

282. Find the derivatives of the following :

$$\frac{\sin(x+a)}{\cos x}.$$

Watch Video Solution

283. Find the derivatives of the following :

$5 \sin x - 6 \cos x + 7$.

Watch Video Solution

284. Find the derivatives of the following :

$3 \cot x + 5 \operatorname{cosec} x$.

Watch Video Solution

285. Find the derivative of the following functions

2 tan x -7 sec x

Watch Video Solution

286. Find the derivatives of the following :

$5\sec x + 4\cos x$.

Watch Video Solution

287. Find the derivatives of the following :

$$\frac{a + b\sin x}{c + d\cos x}.$$

Watch Video Solution

288. Find the derivatives of the following :

$$\frac{4x + 5\sin x}{3x + 7\cos x}.$$

Watch Video Solution

289. Find the derivatives of the following :

$$\frac{\sin x + \cos x}{\sin x - \cos x}.$$

Watch Video Solution

290. Find the derivatives of the following :

$$\frac{\cos x}{1 + \sin x}.$$

Watch Video Solution

291. Find the derivatives of the following :

$$\frac{x^{2\frac{\cos\pi}{4}}}{\sin x}.$$

Watch Video Solution

292. Find the derivatives of the following :

$$\sin^n x.$$

Watch Video Solution

293. Find the derivatives of the following :

$$\frac{x}{\sin^n x}.$$

Watch Video Solution

294. Find the derivatives of the following :

cosec x cot x.

Watch Video Solution

295. Find the derivatives of the following :

$x^4(5\sin x - 3\cos x)$.

Watch Video Solution

296. Find the derivatives of the following :

sin x sin 2x.

Watch Video Solution

297. Find the derivatives of the following :

$\left(x^2+1\right)\cos x.$

Watch Video Solution

298. Find the derivatives of the following :

$\left(x^2-5x+6\right)\sec x$.

Watch Video Solution

299. Find the derivatives of the following :

$x^3 + \sin x.$

Watch Video Solution

300. Find the derivatives of the following :

x sin x.

Watch Video Solution

301. Find the derivatives of the following :

x cosec x.

Watch Video Solution

302. Find the derivatives of the following :

$x^5 \cot x$.

Watch Video Solution

303. Find the derivative of the following

$\left(ax^2 + \sin x\right)(p + q\cos x)$

Watch Video Solution

304. Find the derivatives of the following :

$(x + \cos x)(x - \tan x).$

Watch Video Solution

305. Find the derivatives of the following :

$(x + \sec x)(x - \tan x)$.

Watch Video Solution

306. Use delta method to find the derivatives of the following :

cos (3x + 5) .

Watch Video Solution

307. Use delta method to find the derivatives of the following :

$\cos\left(x - \frac{\pi}{8}\right)$.

Watch Video Solution

308. Use delta method to find the derivatives of the following :

sin (x + 1) .

Watch Video Solution

309. Use delta method to find the derivatives of the following :

$\sin x + \cos x.$

Watch Video Solution

310. Use delta method to find the derivatives of the following :

$\tan 2x.$

Watch Video Solution

311. Find the derivatives of the following :

tan (3x + 1).

Watch Video Solution

312. Use delta method to find the derivatives of the following :

$\sec(2x - 1)$.

Watch Video Solution

313. Find $\frac{dy}{dx}$ when : $y = \frac{x^5 - \cos x}{\sin x}$.

Watch Video Solution

314. Find $\frac{dy}{dx}$ when : $y = \frac{x + \cos x}{\tan x}$.

Watch Video Solution

315. Evaluate the following limit :

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

Watch Video Solution

316. Evaluate the following limit :

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

Watch Video Solution

317. Evaluate the following limit :

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

Watch Video Solution

318. Evaluate the following limit :

$$\lim_{x \to 3} \frac{x^3 - 7x^2 + 15x - 9}{x^4 - 5x^3 + 27x - 27}.$$

Watch Video Solution

319. Evaluate the following limit :

$$\lim_{x \to \infty} \frac{\sqrt{x}}{\sqrt{x + \sqrt{x + \sqrt{x}}}}.$$

Watch Video Solution

320. Evaluate the following limit :

$$\lim_{x \to 0} \frac{(1+x)^6 - 1}{(1+x)^2 - 1}.$$

Watch Video Solution

321. Evaluate the following limit :

$$\lim_{x \to \infty} \frac{ax^2 + bx + c}{dx^2 + ex + f}.$$

Watch Video Solution

322. Evaluate the following limit :

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

Watch Video Solution

323. Evaluate the following limit :

$$\lim_{x \to \infty} \left(\sqrt{x^2 + x + 1} - \sqrt{x^2 + 1}\right).$$

Watch Video Solution

324. Let $f(x) = \frac{ax + b}{x + 1}$, $\lim_{x \to 0} f(x) = 2$ and $\lim_{x \to \infty} f(x) = 1$, Prove that f (- 2) = 0.

Watch Video Solution

325. If $\lim_{x \to 0} kx \cos ecx = \lim_{x \to 0} x \cos eckx$, show that $k = \pm 1$.

Watch Video Solution

326. Evaluate the following :

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

Watch Video Solution

327. If α, β are the zeroes of $ax^2 + bx + c$, then evaluate : $\lim_{x \to \beta} \frac{1 - \cos\left(ax^2 + bx + c\right)}{(x - \beta)^2} .$

Watch Video Solution

328. Find the derivative of $\left(4\sqrt{x} - 2\right)$ w.r.t.x.

Watch Video Solution

329. Find the derivative of $\frac{x^n - a^n}{x - a}$ for some constant a, x $\neq$ a.

Watch Video Solution

330. Find the derivative of the following from first principles :

$\tan\sqrt{x}$.

Watch Video Solution

331. Find the derivative of the following from first principles :

$x^2 \cos x$.

Watch Video Solution

332. Find the derivative of the following from first principles :

$\sqrt[3]{\sin x}$.

Watch Video Solution

333. If $f(x) = x^2 - 3x + 4$, find the value of x for which the derivative is zero.

Watch Video Solution

334. If $f(x) = x^2 - 4x + 3$, find the value of x for which the derivative is 2.

Watch Video Solution