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* Choose the right answer from the given options. [1 Marks Each] [105]

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

   (A) y + 1   (B) y - 1   (C) y   (D) y^2

2. If $y = \frac{\sin x + \cos x}{\sin x - \cos x}$, then $\frac{dy}{dx}$ at x = 0 is:

   (A) -2   (B) 0   (C) $\frac{1}{2}$ (D) does not exist

3. Choose the correct answer.

   $\lim\limits_{x \to \pi} \frac{x^2 \cos x}{1 - \cos x}$ is equal to:

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

4. Choose the correct answer.

   If $f(x) = \begin{cases} x^2 - 1 & 0 < x < 2 \\ 2x + 3, & 2 \geq 3 < 3 \end{cases}$ then the quadeatic equation whose roots are $\lim\limits_{x \to 2^-} f(x)$ and $\lim\limits_{x \to 2^+} f(x)$ is:

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

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

5. Find the derivative of e^{x2}:

   (A) e^{x2} (B) 2^x (C) $2e^{x2}$ (D) $2xe^{x2}$

6. $\lim_{x \to 0} x \sin \frac{1}{x}$ is equal to:

   (A) 0   (B) 1   (C) $\frac{1}{2}$ (D) does not exist

7. If $y = \sqrt{x} + \frac{1}{\sqrt{x}}$, then $\frac{dy}{dx}$ at x = 1 is

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

8. Choose the correct answer.

   $\lim\limits_{x \to 0} \frac{\left(\sqrt{x} - 1\right)\left(2x - 3\right)}{2x^2 + x - 3}$ is:

   (A) $\frac{1}{10}$ (B) $-\frac{1}{10}$ (C) 1   (D) None of these.

9. Evaluate the following limit $\lim_{x \to 0} \frac{1 - \cos 2x}{x^2}$:

   (A) 0   (B) 1   (C) 2   (D) None of these

10. $\lim\limits_{x \to 0} \frac{\sin 5x}{\tan 3x}$

    (A) $-\frac{5}{3}$ (B) $\frac{5}{3}$ (C) $-\frac{7}{3}$ (D) None of these

11. Choose the correct answer.

$\lim\limits_{x\to\pi} \frac{\sin x}{x-\pi}$ is:

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

12. Choose the correct answer.

$\lim\limits_{x\to 0} \frac{\sin x}{\sqrt{x+1}-\sqrt{1-x}}$ is:

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

13. $\lim\limits_{x\to\infty} \sin x$ equals:

(A) 1   (B) 0   (C) ∞ (D) does not exist

14. Find the derivative of e^{x^2}:

(A) e^{x^2} (B) 2x   (C) $2e^{x^2}$ (D) $2xe^{x^2}$

15. Given that f(x) is a differentiable function of x and that f(x) f(y) = f(x) + f(y) + f(xy) −2 and that f(2) = 5.Then f(3) is equal to?

(A) 6   (B) 24   (C) 15   (D) 19

16. Choose the correct answer.

$\lim\limits_{x\to 0} \frac{\sec^2 x-2}{\tan x-1}$ is:

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

17. $\lim\limits_{x\to 1}(1+\cos\pi)\cot^2\pi x :$

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

18. Choose the correct answer.

If $y = \frac{\sin x+\cos x}{\sin x-\cos x}$ then $\frac{dy}{dx}$ at x = 0 is equal to:

(A) -2 (B) 0   (C) $\frac{1}{2}$ (D) Does not exist.

19. f(x) = x − 1+ x − 3 then f (2) =:

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

20. Choose the correct answer.

If $\begin{cases} \frac{\sin[x]}{[x]} & x \neq 0 \\ 0, & [x]=0 \end{cases}$ where [.] denotes the greatest integer function. then $\lim\limits_{x\to 0} f(x)$ is equal to :

(A) 1   (B) 0   (C) -1   (D) None of these.

21. Find the value of $\lim\limits_{x\to 0} \frac{2x^2+3x+4}{2}$

(A) 2   (B) 1   (C) $3\sqrt{5}$ (D) $2\sqrt{5}$

22. What is the value of ddx (sin x tan x)?

(A) sin x + tan x sec x   (B) cos x + tan x sec x

(C) sin x + tan x   (D) sin x + tan x sec^{2}x

23. $\lim\limits_{x \to 0} \frac{\sin 7x}{\sin 3x}$ equals:

(A) $\frac{7}{3}$ (B) $\frac{10}{3}$ (C) $\frac{14}{3}$ (D) $\frac{1}{3}$

24. $\lim\limits_{n \to \infty} \frac{np\sin^2(n!)}{n+1}$, 0 < p < 1 is equal to:

(A) 0   (B) ∞   (C) 1   (D) None

25. The value of $\lim\limits_{x \to 3^+} \frac{|x-3|}{x-3}$ equals:

(A) 1   (B) -1   (C) 0   (D) Does not exist

26. Choose the correct answer.

$\lim\limits_{x \to 0} \frac{1 - \cos 4\theta}{1 - \cos 6\theta}$ is equal to:

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

27. If $y = \frac{1 + \frac{1}{x^2}}{1 - \frac{1}{x^2}}$, then $\frac{dy}{dx} =$

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

28. Evaluate: $\lim\limits_{x \to 2} x^2 - 5x + 6$

(A) 1   (B) -5   (C) 0   (D) 4

29. $\lim\limits_{x \to 0} \frac{t^x - e\sin x}{2(x - \sin x)} =$

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

30. Choose the correct answer.

$\lim\limits_{x \to 0} \frac{x^m - 1}{x^n - 1}$ is equal to:

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

31. Derivative of the function f(x) = (x - 1) (x - 2) is:

(A) 2x + 3   (B) 3x - 2   (C) 3x + 2   (D) 2x - 3

32. If f(x) = 2x - 3, a = 2, l = 1f(x) = 2x - 3, a = 2, l = 1 and ∈ = 0.001 then δ > 0 satisfying 0<|x - a|< δ, | f(x) - l | < ∈, is:

(A) 0.0050   (B) 0.0005   (C) 0.001   (D) 0.0001

33. The limit of $\left[\frac{1}{x^2} + \frac{(2013)^x}{e^x - 1} - \frac{1}{e^x - 1}\right]$ as $x \to 0$:

(A) Approaches +∞   (B) Approaches −∞

(C) Is equal to $\log_e(2013)$ (D) Does not exist

34. Evaluate $\lim\limits_{x \to 3} (4x^2 + 3)$

(A) 36   (B) 39   (C) 40   (D) None of these

35. $\lim \tan x = x \to \frac{\pi}{2}$

(A) 1   (B) 0   (C) $\frac{1}{\pi}$ (D) does not exisz

36. If $y = 5x^2 + 8x$ find $\frac{dy}{dx}$

(A) 10x + 8   (B) 5x + 8   (C) $10x^2 + 8x$ (D) None of these

37. Let $3f(x) - 2f(\frac{1}{x}) = x$ then f(2) is equal to:

(A) $\frac{2}{7}$ (B) $\frac{1}{2}$ (C) 2   (D) 7

38. What is the value of the limit $f(x) = \frac{\sin^2 x + 2\sqrt{\sin x}}{x^2 - 4x}$ if x approaches 0?

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

39. Choose the correct answer.

If $f(x) = 1 - x + x^2 - x^3 + ...-x^{99} + x^{100}$, then f'(1) is equal to:

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

40. Consider the differential equation $\frac{dy}{dx} = \cos x$ Then we observe that:

(A) $y = \sin x$ (B) $y = \sin x + 2$ (C) $y = \sin x - \frac{1}{2}$ (D) $y = \sin x + c$

41. If,$y = (\sin^{-1} x)^2$, then what is the value of $(1 - x^2)y - xy + 4$?

(A) 2   (B) 4   (C) 6   (D) 8

42. What is the value of $\lim y \to 2y^2 - 4y - 2$?

(A) 2   (B) 4   (C) 1   (D) 0

43. The coefficient of y in the expansion of $\left(y^2 + \frac{c}{y}\right)5$ is

(A) 10c   (B) $10c^2$ (C) $10c^3$ (D) None of these

44. What is the value of $\lim y_{y \to \infty} \frac{2}{y}$?

(A) 0   (B) 1   (C) 2   (D) Infinity

45. What is the value of the $\lim_{x \to 5} \frac{32x + 1}{x^2 - 5x}$?

(A) 6.2   (B) 6.4   (C) 6.3   (D) 6.1

46. If $\lim_{x \to 5} \frac{Xk - 5K}{x - 5} = 500$ then k is equal to:

(A) 3   (B) 4   (C) 5   (D) 6

47. Evaluate: $\lim_{x \to 1} \frac{2x^2 + 4x + 4}{2x - 1}$:

(A) 1   (B) 10   (C) 20   (D) 5

48. Choose the correct answer.

If $f(x) = \frac{x^n - a^n}{x - a}$ for some constant, a, then f'(a) is equal to:

(A) 1   (B) 0   (C) Does not exist   (D) $\frac{1}{2}$

49. The derivative of $f(x) = \sin^2 x$ is:

(A) cos 2x   (B) tan 2x   (C) sin 2x   (D) cosec 2x

50. Choose the correct answer.

If $f(x) = \frac{x-4}{2\sqrt{x}}$ then f'(1) is equal to:

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

51. Identify the value of $\lim\limits_{x \to 2} x^2 - 5x + 6$

(A) 1   (B) -5   (C) 0   (D) 4

52. What is the derivative of $\lim\limits_{x \to \infty} \left(x \sin x\left(\frac{2}{x}\right) \right)$?

(A) 2   (B) 1   (C) 3   (D) ∞

53. f $f(x) = 3\cos x$, then f ¢(x) at $x = \frac{\pi}{2}$ = is:

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

54. Choose the correct answer.

If $f(x) = 1 + x + \frac{x^2}{2} + \ldots + \frac{x^{100}}{100}$ then f'(1) is equal to:

(A) $\frac{1}{100}$ (B) 100   (C) does not exist   (D) 0

55. If $\lim\limits_{x \to 0} (\cos x + a \sin bx)^{\frac{1}{x}} = e^2$ then

the possible values of a & amp; bare:'a'&'b'are:

(A) a = 1, b = 2   (B) a = 2, b = 1   (C) a = 3, b = 2   (D) a = 2, b = 3

56. What is the value of ddx $(\sin x^3 \cos x^2)$?

(A) $3x^2 \cos x^2 \cos x^3 + 2x \sin x^3 \sin x^2$ (B) $3x^2\cos 2 \cos x^3 - 2x \sin x^3 \sin x^2$

(C) $2x \cos x^2 \cos x^3 - 2x \sin x^3 \sin x^2$ (D) $2x \cos x^2 \cos x^3 + 3x^2 \sin x^3 \sin x^2$

57. If $f(x) = x^{100} + x^{99} + \ldots + x + 1$, then f(1) is equal to:

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

58. $\lim\limits_{x \to 3} 2x^2 - 3x - 5 =$

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

59. if $f(x) = x^{100} + x^{99} + \cdots + x + 1$, then f'(1) is equal to

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

60. What is the value of the limit $f(x) = x2 + \sqrt{2x}\sqrt{x2} - 4x$ if x approaches infinity?

(A) 0   (B) 2   (C) 5   (D) 4

61. Choose the correct answer.

If $f(x) = \sqrt{x} + \frac{1}{\sqrt{x}}$ then $\frac{dy}{dx}$ at x = 1 is equal to:

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

62. What is the value of $\lim_{y \to \frac{\pi}{2}} \frac{\sin}{x}$?

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

63. If $L = \lim_{x \to 0} \frac{a \sin x - \sin^2 x}{\tan^3 x}$ is finite, then the value of L is:

(A) 1   (B) 2   (C) 3   (D) -1

64. What is the number of critical points for f(x) = max(sinx, cosx) for x belonging to (0, 2π)?

(A) 2   (B) 5   (C) 3   (D) 4

65. What is the value of $\frac{d}{dx}(e^x \tan x)$ at $x = 0$?

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

66. What is the value of What is the value of $\lim_{x \to \infty} \frac{x^2 - 9}{x^2 - 3x + 2}$

(A) 1   (B) 2

(C) 0   (D) Limit does not exist

67. if $f(x) = 1 + x + \frac{x^2}{2} + \cdots + \frac{x^{100}}{100}$, then f'(1) is equal to:

(A) $\frac{1}{100}$ (B) 100   (C) 50   (D) 0

68. What is the value of $\lim_{y \to 4} f(y)$? It is given that f(y) = y² + 6y (y ≥ 2) and f(y) = 0(y < 2).

(A) 40   (B) 16   (C) 0   (D) 30

69. $\lim_{x \to 1} (1 + \cos \pi) \cot^2 \pi x$:

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

70. If $z_r = \cos \frac{r\alpha}{n^2} + i \sin \frac{r\alpha}{n^2}$ where r = 1, 2, 3, ….n then $\lim_{n \to \infty} (z_1 . z_2 \ldots . z_n)$ is equal to:

(A) $\cos \frac{\alpha}{2}$ (B) $\sin \frac{\alpha}{2}$ (C) $e^{i\alpha}$ (D) $\sqrt{e^{i\alpha}}$

71. What is the value of (x + y)² y if x = et sint and y = et cost?

(A) 12(y + y)   (B) 2(y - y)   (C) 2(xy + y)   (D) 2(xy - y)

72. Choose the correct answer.

If $y = \frac{\sin(x+9)}{\cos x}$ then $\frac{dy}{dx}$ at x = 0 is equal to:

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

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

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

74. $\lim\limits_{x\to 0} \frac{ae^x + b\cos x + c.e^x}{\sin^2 x} = 4$ then b:

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

75. What is the value $\lim\limits_{x\to 4} \frac{x^2 - 2x - 8}{x-4}$:

(A) 0   (B) 2   (C) 8   (D) 6

76. Evaluate: $\lim\limits_{x\to 0} \frac{\sin x + \cos x}{\sin x - \cos x}$

(A) 0   (B) 1   (C) -1   (D) ∞

77. What is the value of $\lim\limits_{x\to 3} \frac{x^2 - 9}{x - 3}$

(A) 0   (B) 3   (C) Infinity   (D) 6

78. Choose the correct answer.

If $y = \frac{1 + \frac{1}{x^2}}{1 - \frac{1}{x^2}}$ then $\frac{dy}{dx}$ is equal to:

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

79. Derivative of the function f(x) = $7x^{-3}$ is:

(A) $21x^{-4}$ (B) $-21x^{-4}$ (C) $21x^4$ (D) $-21x^4$

80. Evaluate: $\lim\limits_{n\to\infty} \frac{n!}{(n+1)! - n!}$

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

81. Choose the correct answer.

$\lim\limits_{x\to 0} \frac{\mathrm{cosec} - \cot x}{x}$ is equal to:

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

82. If f′(x) = g(x) and g′(x) = −f(x) for all x and f(2) = 4 = g(2), then $f^2(24) + g^2(24)$ is:

(A) 32   (B) 24   (C) 64   (D) 48

83. The value of $\lim\limits_{x\to a} \frac{\sqrt{x\text{-}b} - \sqrt{a\text{-}b}}{x^2 - a^2}$ $(a > b)$:

(A) $\frac{1}{4a}$ (B) $\frac{1}{a\sqrt{a-b}}$ (C) $\frac{2}{a\sqrt{a-b}}$ (D) $\frac{1}{4a\sqrt{a-b}}$

84. Choose the correct answer.

$\lim\limits_{x\to 0} \frac{\tan 2x - x}{3x - \sin x}$ is equal to:

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

85. If $f(x) = \frac{x^n - a^n}{x - a}$, then f′(a) is:

(A) 1   (B) 0   (C) $\frac{1}{2}$ (D) dose not exist

86. What is the value of $\lim_{y \to 0}(32x^2 \operatorname{cosec}^2 4x)$?

(A) 1   (B) 4   (C) 2   (D) 3

87. If $f(x) = x \sin x$, then $f\left(\frac{\pi}{2}\right)$ is equal to:

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

88. Choose the correct answer.

If $f(x) = x^{100} + x^{99} \ldots\ldots + x + 1$, then $f'(1)$ is equal to:

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

89. Let $f(x) = x - [x], x \in R$, then $f'\left(\frac{1}{2}\right)$ is:

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

90. If $f(x) = 1 - x + x^2 - x^3 + \cdots - x^{99} + x^{100}$, then $f'(1)$ equals

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

91. $\lim_{x \to \pi} \frac{x^2 \cos x}{1 - \cos x}$ is equal to:

     a.   2

     b. $\frac{3}{2}$

     c. $-\frac{3}{2}$

     d.   1

92. If $f(x) = \begin{cases} x^2 - 1 & 0 < x < 2 \\ 2x + 3, & 2 \ge 3 < 3 \end{cases}$ then the quadeatic equation whose roots are $\lim_{x \to 2^-} f(x)$ and $\lim_{x \to 2^+} f(x)$ is:

     a. $x^2 - 6x + 9 = 0$

     b. $x^2 - 7x + 8 = 0$

     c. $x^2 + 14x + 49 = 0$

     d. $x^2 - 10x + 21 = 0$

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

     a. $\frac{1}{10}$

     b. $-\frac{1}{10}$

     c.   1

     d.   None of these.

94. If $y = \frac{\sin x + \cos x}{\sin x - \cos x}$ then $\frac{dy}{dx}$ at x = 0 is equal to:

     a. -2

     b.   0

     c. $\frac{1}{2}$

     d.   Does not exist.

95. $\lim\limits_{x\to 0}\frac{1-\cos 4\theta}{1-\cos 6\theta}$ is equal to:

   a. $\frac{4}{9}$

   b. $\frac{1}{2}$

   c. $\frac{-1}{2}$

   d. -1

96. $\lim\limits_{x\to 0}\frac{x^m-1}{x^n-1}$ is equal to:

   a. 1

   b. $\frac{m}{n}$

   c. $\frac{-m}{n}$

   d. $m^2 n^2$

97. If $f(x) = 1 - x + x^2 - x^3 + \dots - x^{99} + x^{100}$, then $f'(1)$ is equal to:

   a. 150

   b. -50

   c. -150

   d. -50

98. If $f(x) = \frac{x^n - a^n}{x-a}$ for some constant, a, then $f'(a)$ is equal to:

   a. 1

   b. 0

   c. Does not exist

   d. $\frac{1}{2}$

99. If $f(x) = \frac{x-4}{2\sqrt{x}}$ then $f'(1)$ is equal to:

   a. $\frac{5}{4}$

   b. $\frac{4}{5}$

   c. 1

   d. 0

100. If $f(x) = 1 + x + \frac{x^2}{2} + \dots + \frac{x^{100}}{100}$ then $f'(1)$ is equal to:

   a. $\frac{1}{100}$

   b. 100

   c. does not exist

   d. 0

101. If $y = \frac{1+\frac{1}{x^2}}{1-\frac{1}{x^2}}$ then $\frac{dy}{dx}$ is equal to:

   a. $\frac{-4x}{(x^2-1)^2}$

   b. $\frac{-4x}{(x^2-1)^2}$

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

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

102. $\lim\limits_{x\to 0}\frac{\text{cosec}-\cot x}{x}$ is equal to:

   a. $-\frac{1}{2}$

   b. 1

   c. $\frac{1}{2}$

   d. -1

103. $\lim\limits_{x\to 0}\frac{(1+x)^n-1}{x}$ is equal to:

   a. n

   b. 1

   c. $-n$

   d. 0

104. $\lim\limits_{x\to 0}\frac{\tan 2x-x}{3x-\sin x}$ is equal to:

   a. 2

   b. $\frac{1}{2}$

   c. $-\frac{1}{2}$

   d. $\frac{1}{4}$

105. If f(x) = $x^{100} + x^{99}$ .... + x + 1, then f'(1) is equal to:

   a. 5050

   b. 5049

   c. 5051

   d. 50051

   * Answer the following questions in one sentence. [1 Marks Each]   [23]

106. Find the derivative of
   $\left(5x^3 + 3x - 1\right)(x - 1)$

107. Find the derivative of x^{-3} (5 + 3x)

108. Find the derivative of x^5 (3 - $6x^{-9}$)

109. Find the derivative of x^{-4}(3 - $4x^{-5}$)

110. Find the derivative of the function 5sec x + 4cos x

111. Find the derivative of function sin (x + 1) from first principle.

112. Find the derivative of function $f(x) = \cos\left(x - \frac{\pi}{8}\right)$ from first principle.

113. Find the derivative of function $\frac{\sin(x+a)}{\cos x}$ (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers).

114. Find the derivative of the function x^4 (5 sin x - 3 cos x).

115. Find the derivative of function $(ax^2 + \sin x)(p + q \cos x)$ (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers).

116. Find the derivative of function $\frac{x}{1+\tan x}$ (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers).

117. Find the limit: $\lim\limits_{x \to 1} \left[x^3 - x^2 + 1\right]$

118. Find the limit: $\lim\limits_{x \to -1} \left[1 + x + x^2 + \ldots + x^{10}\right]$

119. Find the limit: $\lim\limits_{x \to 2} \left[\frac{x^3 - 2x^2}{x^2 - 5x + 6}\right]$

120. Find the limit: $\lim\limits_{x \to 1} \left[\frac{x-2}{x^2 - x} - \frac{1}{x^3 - 3x^2 + 2x}\right]$

121. Evaluate: $\lim\limits_{x \to 1} \frac{x^{15} - 1}{x^{10} - 1}$

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

123. Find the derivative of the function f(x) = 2x² + 3x - 5 at x = - 1. Also, prove that f'(0) + 3f'(-1) = 0.

124. Find the derivative of f(x) = x².

125. Find the derivative of f(x) = 1 + x + x² + x³ + ... + x⁵⁰ at x = 1.

126. Compute the derivative of f(x) = sin² x.

127. Find the derivative of f from the first principle, where f is given by $f(x) = \frac{2x+3}{x-2}$

128. Find the derivative of f from the first principle, where f is given by $f(x) = x + \frac{1}{x}$

* **Given section consists of questions of 2 marks each.** [86]

129. Evaluate $\lim\limits_{x \to 4} \frac{4x+3}{x-2}$

130. Evaluate $\lim\limits_{x \to -1} \frac{x^{10} + x^5 + 1}{x - 1}$

131. Evaluate $\lim\limits_{x \to 0} \frac{(X+1)^5 - 1}{x}$

132. Evaluate $\lim\limits_{x \to 2} \frac{3x^2 - x - 10}{x^2 - 4}$

133. Evaluate $\lim\limits_{x \to 3} \frac{x^4 - 81}{2x^2 - 5x - 3}$

134. Evaluate $\lim\limits_{z \to 1} \frac{z^{1/3} - 1}{z^{1/6} - 1}$

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

136. Evaluate $\lim\limits_{x \to -2} \frac{\frac{1}{x} + \frac{1}{2}}{x + 2}$

137. Evaluate $\lim\limits_{x \to 0} \dfrac{\sin ax}{bx}$

138. Evaluate $\lim\limits_{x \to 0} \dfrac{\sin ax}{\sin bx}$, $a,\ b \neq 0$

139. Evaluate $\lim\limits_{x \to \pi} \dfrac{\sin(\pi-x)}{\pi(\pi-x)}$

140. Evaluate $\lim\limits_{x \to 0} \dfrac{\cos x}{\pi-x}$

141. Evaluate $\lim\limits_{x \to 0} \dfrac{\cos 2x-1}{\cos x-1}$

142. Evaluate $\lim\limits_{x \to 0} \dfrac{ax+x\cos x}{b\sin x}$.

143. Evaluate $\lim\limits_{x \to 0} x\sec x$

144. Evaluate $\lim\limits_{x \to 0} \dfrac{\sin ax+bx}{ax+\sin bx}$; a, b, a + b $\neq$ 0.

145. Evaluate $\lim\limits_{x \to 0} (\operatorname{cosec} x - \cot x)$

146. Evaluate $\lim\limits_{x \to \frac{\pi}{2}} \dfrac{\tan 2x}{x-\frac{\pi}{2}}$

147. Evaluate $\lim\limits_{x \to 0}$ f(x), where f(x) = $\begin{cases} \dfrac{|x|}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$

148. Find $\lim\limits_{x \to 0} f(x)$ where $f(x) = \begin{cases} \dfrac{x}{|x|}, & x \neq 0 \\ 0, & x = 0 \end{cases}$

149. Find $\lim\limits_{x \to 5} f(x)$, where f(x) = |x| - 5

150. If the function f(x) satisfies $\lim\limits_{x \to 1} \dfrac{f(x)-2}{x^2-1} = \pi$, then evaluate $\lim\limits_{x \to 1} f(x)$.

151. Find the derivative of $1/x^2$ from the first principle.

152. Find the derivative of $\left(\dfrac{x+1}{x-1}\right)$ from the first principle.

153. For the function $f(x) = \dfrac{x^{100}}{100} + \dfrac{x^{99}}{99} + \ldots + \dfrac{x^2}{2} + x + 1$ prove that f'(1) = 100f'(0)

154. Find the derivative of $x^n + ax^{n-1} + a^2x^{n-2} + \ldots + a^{n-1} x + a^n$ for some fixed real number a.

155. For some constants a and b, find the derivative of (x - a)(x - b)

156. Find the derivative of $\dfrac{x^n-a^n}{x-a}$ for some constant a.

157. Find the derivative of the function $5\sin x - 6\cos x + 7$

158. Find the derivative of function $\dfrac{1+\frac{1}{x}}{1-\frac{1}{x}}$ (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers).

159. Find the derivative of function $\frac{1}{ax^2+bx+c}$ (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers).

160. Find the derivative of function $\frac{a}{x^4} - \frac{b}{x^2} + \cos x$ (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers).

161. Find the derivative of function $4\sqrt{x} - 2$ (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers).

162. Find the derivative of function $\frac{\sin x + \cos x}{\sin x - \cos x}$ (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers).

163. Find the derivative of function $\frac{\sec x - 1}{\sec x + 1}$ (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers)

164. Find the derivative of function $\frac{a + b\sin x}{c + d\cos x}$ (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers)

165. Find the derivative of the function $f(x) = \frac{4x + 5\sin x}{3x + 7\cos x}$

166. Find the derivative of the function $\frac{x^2 \cos\left(\frac{\pi}{4}\right)}{\sin x}$ (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers)

167. Evaluate:

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

168. Evaluate:

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

169. Differentiate the following functions.

$$\frac{x^4 + x^3 + x^2 + 1}{x}$$

170. Evaluate:

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

171. Find 'n' if $\lim_{x \to 2} \frac{x^n - 2^n}{x - 2} = 80, x \in N$

  * **Given section consists of questions of 3 marks each.** [66]

172. Find the derivative of $\frac{2}{x+1} - \frac{x^2}{3x-1}$

173. Find the derivative of function cosec x cot x.

174. Evaluate:

$$\lim_{x \to \frac{\pi}{3}} \frac{\sqrt{1 - \cos 6}}{\sqrt{2}\left(\frac{\pi}{3} - x\right)}$$

175. Evaluate:

$$\lim_{x \to 3} \frac{x^3 + 27}{x^5 + 243}$$

176. Evaluate:

$$\lim_{x \to 1} \frac{x^7 - 2x^5 + 1}{x^3 - 3x^2 + 2}$$

177. Evaluate:

$$\lim_{x \to 0} \frac{\sqrt{1 + x^3} - \sqrt{1 - x^3}}{x^2}$$

178. Evaluate:

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

179. If $\lim_{x \to 1} \frac{x^4 - 1}{x - 1} = \lim_{x \to k} \frac{x^3 - k^3}{x^2 - k^2}$ then find the value of K.

180. Evaluate:

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

181. Evaluate:

$$\lim_{x \to a} \frac{(2 + x)^{\frac{5}{2}} - (a + 2)^{\frac{5}{2}}}{x - a}$$

182. Differentiate the following functions.

$$\frac{x^5 - \cos x}{\sin x}$$

183. Evaluate:

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

184. Evaluate:

$$\lim_{x \to \frac{\pi}{6}} \frac{\cot^2 x - 3}{\operatorname{cosec} x - 2}$$

185. Evaluate:

$$\lim_{x \to 0} \frac{1 - \cos mx}{1 - \cos nx}$$

186. Evaluate:

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

187. Evaluate:

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

188. Evaluate:

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

189. Differentiate the following functions.

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

190. Differentiate the following functions.

$\dfrac{x^5-\cos x}{\sin x}$

191. Differentiate the following functions.

$\sin^3 x \cos^3 x$

192. Evaluate:

$\lim\limits_{x\to\frac{\pi}{6}} \dfrac{\sqrt{3}\sin x - \cos x}{x-\frac{\pi}{6}}$

193. Differentiate the following functions.

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

* **Given section consists of questions of 5 marks each.** [40]

194. Evaluate the following limits.

$\lim\limits_{x\to 0} \dfrac{(\sin(\alpha+\beta)x + \sin(\alpha-\beta)x + \sin 2\alpha\cdot x}{\cos 2\beta x - \cos 2\alpha x}$

195. Evaluate the following limits.

$\lim\limits_{x\to\pi} \dfrac{1-\sin\frac{x}{2}}{\cos\frac{x}{2}\left(\cos\frac{x}{4}-\sin\frac{x}{4}\right)}$

196. Evaluate:

$\lim\limits_{x\to a} \dfrac{\sin x - \sin a}{\sqrt{x}-\sqrt{a}}$

197. Evaluate the following limits.

$\lim\limits_{x\to\frac{\pi}{4}} \dfrac{\tan^3 x - \tan x}{\cos\left(x+\frac{\pi}{4}\right)}$

198. Evaluate the following limits.

$\lim\limits_{y\to 0} \dfrac{(x+y)\sec(x+y) - x\sec x}{y}$

199. Evaluate the following limits.

Let $\begin{cases} \dfrac{k\cos x}{\pi - 2x}, \\ 3, x = \frac{\pi}{2} \end{cases}$ and $f(x) = f\left(\frac{\pi}{2}\right)$ Find the value of k.

200. Evaluate:

$\lim\limits_{x\to 0} \dfrac{\sqrt{2}-\sqrt{1+\cos x}}{\sin^2 x}$

201. Evaluate:

$\lim\limits_{x\to 0} \dfrac{2\sin x - \sin 2x}{x^3}$

----- Happiness depends upon ourselves -----