MATHS

BOOKS - MBD MATHS (ODIA ENGLISH)

CONTINUITY AND DIFFERENTIABILITY

Question Bank

1. Examine the continuity of the following functions at indicated points.

$$f(x) = \begin{cases} \left(\frac{x^2 - a^2}{x - a}, \quad \text{if} \quad x \neq a \right. \\ atx = a), (a, \quad \text{if} \quad x = a) : \end{cases}$$

2. Examine the continuity of the following functions at indicated points.

$$f(x) = \begin{cases} \left(\frac{\sin 2x}{x} \quad \text{if} \quad x \neq 0 \text{ at x=0}),(2 \text{ if x=0}):\right\}` \end{cases}$$

3. Examine the continuity of the following functions at indicated points.

$$f(x) = \left\{\left((1+2x)^{\frac{1}{2}} \quad \text{if} \quad x \neq 0\right), \left(e^2 \quad \text{if} \quad x = 0 \right.\right.$$

$$\left.\left. at x = 0\right) :\right\}$$

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4. Examine the continuity of the following functions at indicated points.

$$f(x) = \begin{cases} x \sin \frac{1}{x} & \text{if} \quad x \neq 0 at x = 0 \\ 0 & \text{if} \quad x = 0 \end{cases}$$

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5. Examine the continuity of the following functions at indicated points.

$$f(x) = \begin{cases} \frac{x^2-1}{x-1} & \text{if } x \neq 1 at x = 1 \\ 2 & \text{if } x = 1 \end{cases}$$

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6. Examine the continuity of the following functions at indicated points.

$$f(x) = \begin{cases} \sin \frac{1}{x} & \text{if } x \neq a \\ 0 & \text{if } x = 0 at x = 0 \end{cases}$$

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7. Examine the continuity of the following functions at indicated points.

$$f(x) = [3x + 11] at x = -\frac{11}{3}$$

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8. Examine the continuity of the following functions at indicated points.

$$f(x) = \begin{cases} \frac{e^{\frac{1}{x}} - 1}{e^{\frac{1}{x}} + 1} & \text{if } x \neq 0 at x = 0 \\ 0 \text{ if } x = 0 \end{cases}$$

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9. Examine the continuity of the following functions at indicated points.

$$f(x) = \begin{cases} \frac{1}{x+[x]} & \text{if } x < 0 \\ -1 & \text{if } x \geq 0 \end{cases}$$

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10. Examine the continuity of the following functions at indicated points.

$$f(x) = \begin{cases} \frac{[x]}{x} & \text{if } x \neq 0 at x = 0 \\ 0 & \text{if } x = 0 \end{cases}$$

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11. Examine the continuity of the following functions at indicated points.

$$f(x) = \begin{cases} \left(\dfrac{1}{e^{\frac{1}{2}} - 1} \right. & \text{if} \quad x > 0 \\ atx = 0), (0 \quad \text{if} \quad x \leq 0) : \end{cases}$$

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12. Examine the continuity of the following functions at indicated points.

$$f(x) = \sin \frac{\pi[x]}{2} atx = 0$$

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13. Examine the continuity of the following functions at indicated points.

$$f(x) = \frac{g(x) - g(1)}{x - 1} at x = 1$$

where $g(x) = |x - 1|$

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14. If a function is continuous at x=a, then find

$$\lim_{h \to 0} + \frac{1}{2}\{f(a + h) + f(a - h)\}$$

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15. If a function is continuous at x=a, then find

$$\lim_{h \to 0} + \frac{1}{2}\{f(a+h) - f(a-h)\}$$

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16. Find the value of a such that the function f defined by

$$f(x) = \begin{cases} \frac{\sin ax}{\sin x} & \text{if} \quad x \neq 0 \\ \frac{1}{a} & \text{if} \quad x = 0 \end{cases}$$

is continuous at x=0.

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17. If $f(x) = \begin{cases} ax^2 + b & \text{if } x < 1 \\ 1 & \text{if } x = 1 \\ 2ax - b & \text{if } x > 1 \end{cases}$

is continuous at x=1, then find a and b.

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18. Show that sinx is continuous for every real x.

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19. Show that the function f defined by

$f(x) = \begin{cases} 1 & \text{if } \text{x is rational} \\ 0 & \text{if } \text{x is irrational} \end{cases}$

is discontinuous $\forall \neq 0 \in \alpha$

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20. Show that the function f defined by

$$f(x) = \begin{cases} x & \text{if } \text{x is rational} \\ -x & \text{if } \text{x is irrational} \end{cases}$$

is continuous at x=0 $\forall x \neq 0 \in R$

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21. Show that the function f defined by

$$f(x) = \begin{cases} x & \text{if } \text{x is rational} \\ 0 & \text{if } \text{x is irrational} \end{cases}$$

is discontinuous everywhere except at x=0.

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22. Show that $f(x) = \begin{cases} x \sin \frac{1}{x} & x \neq 0 \\ o & x = 0 \end{cases}$

is continuous at x=0

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23. Prove that $e^x - 2 = 0$ has a solution between 0 and 1.

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24. So that $x^5 + x + 1 = 0$ for some value of x between -1 and 0.

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25. Differentiate from definition

e^{3x}

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26. Differentiate from definition

2^{X^2}

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27. Differentiate from definition

`ln (3x+1)

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28. Differentiate from definition

$\log x^5$

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29. Differentiate from definition

`In sin x

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30. Differentiate from definition

$x^2 a^{2x}$

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31. Find derivatives of the following functions.

$$\left(x^2+5\right)^8$$

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32. Find derivatives of the following functions.

$$\frac{1}{\left(x^3+\sin x\right)^2}$$

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33. Find derivatives of the following functions. In

$$\left(\sqrt{x}+1\right)$$

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34. Find derivatives of the following functions.sin 5x + cos7x

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35. Find derivatives of the following functions.

$e^{\sin t}$

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36. Find derivatives of the following functions.

$$\sqrt{ax^2 + bx + c}$$

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37. Find derivatives of the following functions.

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

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38. Find derivatives of the following functions.

$\sec(\tan\theta)$

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39. Find derivatives of the following functions.

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

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40. Find derivatives of the following functions.

$\sqrt{\tan(3z)}$

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41. Find derivatives of the following functions.

$\tan^3 x$

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42. Find derivatives of the following functions.

$\sin^4 x$

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43. Find derivatives of the following functions.

$\sin^2 x \cos^2 x$

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44. Find derivatives of the following functions.

$\sin 5x \cos 7x$

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45. Find derivatives of the following functions.

$\tan x \cot 2x$

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46. Find derivatives of the following functions.

$\sqrt{\sin \sqrt{x}}$

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47. Find derivatives of the following functions.

$\sqrt{\sec(2x+1)}$

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48. Find derivatives of the following functions.

$\cos ec(ax+b)^2$

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49. Find derivatives of the following functions.

a^{Inx}

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50. Find derivatives of the following functions.

$a^{x^2} b^{x^3}$

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51. Find derivatives of the following functions.In tan x

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52. Find derivatives of the following functions.

$5^{\sin x^2}$

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53. Find derivatives of the following functions.

$In \tan\left(\frac{\pi}{4} + \frac{x}{2}\right)$

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54. Find derivatives of the following functions

$\sqrt{\left(a^{\sqrt{x}}\right)}$

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55. Find derivatives of the following functionsIn $\left(e^{nx}+e^{-nx}\right)$

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56. Find derivatives of the following functions $e^{\sqrt{ax}}$

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57. Find derivatives of the following functions $\sqrt{\log x}$

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58. Find derivatives of the following functions

$\left(e^{\sin x} - a^{\cos x}\right)$

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59. Find derivatives of the following functions

$$\frac{e^{3x^2}}{\ln(\sin x)}$$

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60. Prove the formulae(4) to (7).

$$\frac{d}{dx}\left(\cos^{-1} x\right) = \frac{-1}{\sqrt{1} - x^2}$$

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61. Find derivatives of the following functions.

$\sin^{-1} 2x$

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62. Find derivatives of the following functions.

$\cot^{-1} \sqrt{x}$

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63. Find derivatives of the following functions.

$\sec^{-1}(2x+1)$

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64. Find derivatives of the following functions.

$\cos^{-1}\sqrt{\frac{1+x}{2}}$

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65. Find derivatives of the following functions.

$$\cos^{-1}\left(\frac{x-\frac{1}{x}}{x+\frac{1}{x}}\right)$$

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66. Find derivatives of the following functions.

$$\tan^{-1}\left(\cos\sqrt{x}\right)$$

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67. Find derivatives of the following functions.

$$x^2 \cos ec^{-1}\left(\frac{1}{Inx}\right)$$

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68. Find derivatives of the following functions.

$$\cot^{-1}\frac{\sqrt{1-x^2}}{x}$$

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69. Find derivatives of the following functions.

$$\left(x \sin^{-1} x\right)^{15}$$

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70. Find derivatives of the following functions.

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

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71. Differntiate the following functions by proper substitution.

$\sin^{-1} 2x\sqrt{1-x^2}$

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72. Differntiate the following functions by proper substitution.

$\tan^{-1}\left[\frac{2x}{1-x^2}\right]$

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73. Differntiate the following functions by proper substitution.

$$\tan^{-1}\sqrt{\frac{1-t}{1+t}}$$

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74. Differntiate the following functions by proper substitution.

$$\left[\left(\frac{1+t^2}{1-t^2}\right)^2-1\right]^{\frac{1}{2}}$$

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75. Differntiate the following functions by proper substitution.

$$\tan^{-1}\frac{\sqrt{x}+\sqrt{a}}{1-\sqrt{x}a}$$

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76. Differntiate the following functions by proper substitution.

$$\sin^{-1}\left(\frac{2x}{1+x^2}\right)$$

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77. Differntiate the following functions by proper substitution.

$$\sec^{-1}\left(\frac{\sqrt{a^2+x^2}}{a}\right)$$

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78. Differntiate the following functions by proper substitution.

$$\sin^{-1}\left(\frac{2\sqrt{t^2-1}}{t^2}\right)$$

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79. Differntiate the following functions by proper substitution.

$$\cos^{-1}\left(\frac{1-t^2}{1+t^2}\right)$$

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80. Differntiate the following functions by proper substitution.

$$\cos^{-1}\left(2t^2-1\right)$$

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81. Find derivatives of the following function.

x^x

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82. Find derivatives of the following function.

$\left(1+\frac{1}{x}\right)^x$

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83. Find derivatives of the following function.

$x^{\sin x}$

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84. Find derivatives of the following function.

$(\log x)^{\tan x}$

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85. Find derivatives of the following function.

2^{2^x}

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86. Find derivatives of the following function.

$$\left(1+\sqrt{x}\right)^{x^2}$$

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87. Find derivatives of the following function.

$$\left(\sin^{-1} x\right)^{\sqrt{1-x^2}}$$

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88. Find derivatives of the following function.

$(\tan x)^{\log x^3}$

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89. Find derivatives of the following function.

$x^{1/x} + (\sin x)^x$

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90. Find derivatives of the following function.

$(\cos x)^x + x^{\cos x}$

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91. Find derivatives of the following function.

$$\left(x^2+1\right)^{2/3}(3x+1)^{1/4}.\sqrt{x}$$

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92. Find derivatives of the following function.

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

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93. Find derivatives of the following function.

$$(\sin x)^x \sqrt{\sin x}\left(1+x^2\right)^{\frac{1}{2}+x}$$

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94. Find derivatives of the following function.

$$(\sec x+\tan x)^{\cot x}$$

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95. Find derivatives of the following function.

$$\left(2^{\sqrt{x}}\right)^{1+\sqrt{x}}$$

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96. Find dy/dx

$$xy^2 + x^2y + 1 = 0$$

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97. Find dy/dx

$$x^{\frac{1}{2}}y^{-\frac{1}{2}} + x^{\frac{3}{2}}y^{-\frac{3}{2}} = 0$$

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98. Find dy/dx

$x^2 + 3y^2 = 5$

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99. Find dy/dx

y^2 cot x = x^2 cot y`

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100. Find dy/dx

y = tan xy

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101. Find dy/dx

x = y ln (xy)

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102. Find dy/dx

$e^{xy} + y \sin x = 1$

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103. In $\sqrt{x^2+y^2} = \tan^{-1}\frac{y}{x}$

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104. Find dy/dx

$y^x = x^{\sin y}$

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105. If sin (x + y) = y cos (x + y) then prove that

$$\frac{dy}{dx} = -\frac{1+y^2}{y^2}$$

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106. If $\sqrt{1-x^4}+\sqrt{1-y^4}=k\left(x^2-y^2\right)$ then show that

$$\frac{dy}{dx}=\frac{x\sqrt{1-y^4}}{y\sqrt{1-x^4}}$$

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107. Find $\frac{dy}{dx}$,

`x=a cos'theta', y=a sin theta.

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108. Find $\frac{dy}{dx}$,

$x = at^2, y = 2at$

and find the value at=1/2

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109. Find $\frac{dy}{dx}$,

$x = a\cos^3 t, y = a\sin^3 t,$ find the value at $\frac{\pi}{4}$

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110. Find $\frac{dy}{dx}$,

$\sin x = \frac{2t}{1+t^2}, \tan y = \frac{2t}{1-t^2}$

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111. Find $\frac{dy}{dx}$,

$x = 3\cos t - 2\cos^3 t,$

$y = 3\sin t - 2\sin^3 t.$

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112. Differentiate.

$\sqrt{x}$.w.r.t. x^2

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113. Differentiate.

$\sin x.\ w.\ r.\ t.\ \cot x$

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114. Differentiate.

$\frac{1-\cos x}{1+\cos x} w.\ r.\ t \frac{1-\sin x}{1+\sin x}$

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115. Differentiate.

$\tan^{-1} x.\ w.\ r.\ t.\ \tan^{-1} \sqrt{1+x^2}$

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116. Differentiate.

$\sin^{-1}\left(\frac{2x}{1+x^2}\right) w.\ r.\ t.\ \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$

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117. Test differentiability and continuity of the following functions.

$\left|1-\frac{1}{x}\right|$ at x = 1

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118. Test differentiability and continuity of the following functions.

$x^2|x|atx=0$

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119. Test differentiability and continuity of the following functions.

f(x) = tan x at $x = \frac{\pi}{2}$

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120. Test differentiability and continuity of the following functions.

f(x) = cot x at $x = \frac{\pi}{2}$

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121. Test differentiability and continuity of the following functions.

f(x) = $|\sin x| at x = \pi$

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122. Test differentiability and continuity of the following functions.

f(x) = $\frac{x}{1+|x|} at x = 0$

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123. Test differentiability and continuity of the following functions.

$$f(x) = \begin{cases} x \sin\left(\frac{1}{x}\right) & x \neq 0 \\ 0 & x = 0 \end{cases} atx = 0.$$

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124. State True or False .There is no function whose derivative is log π

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125. State True or False .There is no function which is its own derivative.

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126. State True or False .A function is not differentiable at $x = c \Rightarrow f$is not continuous at x=c.

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127. $\left[x^2\right]$is differentiable on (-1,1):

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128. State True or False . |x+2|is not differentiable at x=2

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129. Derivative of $e^{3\log x}$ w.r.t.x is $3x^2$.

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130. The derivative of a non constant even function is always an odd function.

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131. If f and g are not derivable at $x_0$then f+g is not derivable at x_0.

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132. If $u$is a constant and v is a variable then(du) $u^v \, In\frac{v}{dv} =$ _____.

A. u^v ln v

B. vu^{v-1}

C. u^v ln u

D. uv^{v-1}

Answer: C

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133. If $t = e^a$ then d/dx x^t=_____

A. tx^{t-1}

B. x^t

C. $x^t \ln a$

D. tx^1

Answer: A

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134. If $u = t^2 \text{and} v = \sin t^2$ then dv/du=_____.

A. $\cos^2 t$

B. $\frac{\sin t}{t}$

C. $\sec t^2$

D. $\cos t^2$

Answer: A

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135. The tangent to the curve $y = \left(1 + x^2\right)^2$ at x=-1 has slope _____.

A. 4

B. -4

C. 8

D. -8

Answer: D

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136. If $y = (gof)(x) then \frac{dy}{dx} =$ _____.

A. (dg)/dxdx/(df)

B. (dg)/(df)(df)/dx

C. (df)/dxdx/(dg)

D. (df)/(dg)(dg)/dx

Answer: B

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137. If $y = \frac{\sec^{-1}\left(\sqrt{x}+1\right)}{\sqrt{x}} + \sin^{-1}\frac{\sqrt{x}}{\sqrt{x}+1} then \frac{dy}{dx} =$

A. 0

B. undefined

C. $\frac{\pi}{2}$

D. 1

Answer: A

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138. If (x) $= \sqrt{x^2 - 2x + 1}, x \in [0, 2]$ then at x=1f'(x)=_____

A. f'(x)=1 for all x

B. f'(x)=−1 for all x≤1

C. f'(x)=1 for all x>1

D. none of these

Answer: A

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139. If f(x)=$\left[x^2\right]$ then f(3/2)=_____

A. 0

B. 2

C. 3

D. does not exist

Answer: A

140. Differentiate from first principles.

e^{2x}

141. Differentiate from first principles.

$\sin^2 x$

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142. Differentiate from first principles.

$\cos x^2$

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143. Differentiate from first principles.

e^{x^2}

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144. Differentiate from first principles.

$\sqrt{\tan x}$

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145. Differentiate from first principles.

$x^2 \sin x$

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146. Differentiate from first principles.

In sin x

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147. Differentiate from first principles.

$\sin \sqrt{x}$

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148. Differentiate from first principles.

cos x.

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149. Test differentiability of the following function at the indicated points.

$$f(x) = \left[x^2 + 1\right] at x = -\frac{1}{2}$$

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150. Test differentiability of the following function at the indicated points.

$$f(x) = \begin{cases} 1 - 2x & x \leq \frac{1}{2} \\ x - \frac{1}{2} & x > \frac{1}{2} \end{cases} at x = \frac{1}{2}$$

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151. Test differentiability of the following function at the indicated points.

f(x)=x+|cosx|at x= $\frac{\pi}{2}$

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152. Differentiate.

$$\frac{1}{In\left(x\sqrt{x+1}\right)}$$

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153. Differentiate.

$$\frac{Inx}{e^x \sin x}$$

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154. .Differentiate.

$$e^x(\tan x - \cot x)$$

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155. Differentiate.

$$\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) x \tan x$$

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156. Differentiate.

$$\frac{\cos 3x - \cos x}{\cos 5x - \cos 3x}$$

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157. Differentiate.

$$x^2 e^x \cos ecx$$

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158. Differentiate.

$$\frac{(x+1)Inx}{\sqrt{x+2}}$$

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159. Differentiate.

$$\left(x^3-1\right)^9 \sec^2 x$$

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160. Differentiate.

$$\sin^2\left(\cos^{-1} x\right)$$

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161. Differentiate.

$$a^x\left(x+\frac{1}{x}\right)^{10}$$

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162. Differentiate.

$$In\frac{\sqrt{x+4}-2}{\sqrt{x+4}+2}$$

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163. Differentiate.

$$In\frac{4x^2(2x-7)^3}{(3x^2-7)^5}$$

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164. Differentiate.

$$5^{\ln \sin x}$$

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165. Differentiate.

$$\sqrt{\sin\sqrt{x}}$$

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166. Differentiate.

$x^{\sin x} + (\tan x)^x$

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167. Differentiate.

e^{e^x}

Watch Video Solution

168. Differentiate.

$x^{\sqrt{x}}$

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169. Differentiate.

$\sec^{-1}(e^x + x)$

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170. Differentiate.

$In\cos e^x$

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171. Differentiate.

$a^{\sin^{-1} x^2}$

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172. Differentiate.

$\cos^{-1}\left(\frac{x^4-1}{x^4+1}\right)$

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173. Differentiate.

$$(x^e)^{e^x} + (e^x)^{x^e}$$

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174. Differentiate.

$$x^{(x^x)}$$

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175. Differentiate.

$$\frac{(x+1)^2\sqrt{x-1}}{(x^2+3)^3 3^x}$$

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176. Differentiate.

$$\left[5In\left(x^3+1\right)-x^4\right]^{2/3}$$

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177. Differentiate

$$\sec^{-1}\left(\frac{x^2+1}{x^2-1}\right)$$

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178. Differentiate

$$e^{\tan^{-1}x^2}$$

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179. Differentiate

$$\frac{x \sin^{-1} x}{\sqrt{1+x^2}}$$

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180. Differentiate

$$\tan^{-1} e^{2x}$$

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181. Differentiate

$$\tan^{-1}\frac{\cos x}{1+\sin x}$$

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182. Differentiate

$$\tan^{-1}\frac{(\cos x-\sin x)}{(\cos x+\sin x)}$$

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183. Differentiate

$$\tan^{-1}\frac{7x}{1-12x^2}$$

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184. Differentiate

$$\tan^{-1}\frac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}$$

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185. Differentiate if

$$y = \cos^{-1}\frac{\sqrt{x}-1}{\sqrt{x}+1} + \cos ec^{-1}\frac{\sqrt{x}+1}{\sqrt{x}-1}$$

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186. Differentiate

$$\tan^{-1}\frac{x}{1+\sqrt{1-x^2}}$$

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187. Differentiate

$$\tan^{-1}\left(\frac{x\sin\alpha}{1-x\cos\alpha}\right)$$

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188. Find dy/dx if

$$x^3+y^3=12xy$$

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189. Find dy/dx if

$$\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}} = 1$$

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190. Find dy/dx if

$$x^y = c$$

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191. Find dy/dx if

$y^x = c$

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192. Find dy/dx if

x cot y + y cosec x = 0

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193. Find dy/dx if

$y^2 + x^2 = In(x + y) + 1$

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194. Find dy/dx if

$(\cos x)^y = \sin y$

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195. Find dy/dx if

$y^2 = a^{\sqrt{x}}$

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196. Find dy/dx if

$$x^m y^n = \left(\frac{x}{y}\right)^{m+n}$$

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197. Find dy/dx if

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

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198. Find dy/dx if

$$y = \sin y)^{\sin 2x}$$

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199. Find dy/dx if

$y^2 = x^y$

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200. Find dy/dx if

$(x + y)^{\cos x} = e^{x+y}$

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201. Find dy/dx if

x tan y + y tan x = 0

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202. Find dy/dx if

$$\log \sqrt{x^2 + y^2} = \tan^{-1}\left(\frac{y}{x}\right)$$

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203. Defferentiate

$$\tan^{-1} \frac{2x}{1 - x^2} w.r.t. \sin^{-1} \frac{2x}{1 + x^2}$$

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204. Defferentiate

$$\sec^{-1}\left(\frac{1}{2x^2-1}\right) w.\ r.\ t.\ \sqrt{1-x^2}$$

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205. Defferentiate

$$\tan^{-1}\left(\frac{\sin x}{1+\cos x}\right) w.\ r.\ t.\ \tan^{-1}\left(\frac{\cos x}{1+\sin x}\right)$$

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206. Find the dy/dx when

$x = a[\cos t + \log \tan(t/2)], y = a \sin t$

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207. Find the dy/dx when

$\sin x = \frac{2t}{1+t^2}, \tan y = \frac{2t}{1-t^2}$

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208. Find the dy/dx when

$$\cos x = \sqrt{\frac{1}{1+t^2}}, \sin y = \frac{2t}{1+t^2}$$

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209. Find the dy/dx when

$$x = \sqrt{\sin 2u}, y = \sqrt{\cos 2u}$$

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210. Assuming the validity of the operations on the r.h.s. find $\frac{dy}{dt}$

$$y = \sqrt{\left[\sin x + \sqrt{\left\{\sin x + \sqrt{(\sin x + \ldots\ldots .)}\right]}\right\}}$$

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211. Assuming the validity of the operations on the r.h.s. find $\frac{dy}{dt}$

$$y = 1 \div [x + 1 \div (x + 1 \div (x + 1 \div \ldots\ldots .))]$$

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212. Assuming the validity of the operations on the r.h.s. find $\frac{dy}{dt}$

$y = \ln[x + In(x + \ln(x + \ldots\ldots .))]$

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213. If cos y = x cos(a+y) then prove that

$$\frac{dy}{dx} = \frac{\cos^2(a+y)}{\sin a}$$

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214. If $e^{\theta\phi} = c + 4\theta\phi$,

show that $\phi + \theta\dfrac{d\phi}{d\theta} = 0$

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215. Can you differentiate $\log\log|\sin x|$?

Justify your answer.

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216. If $x = \frac{1-\cos^2\theta}{\cos\theta}, y = \frac{1-\cos^{2n}\theta}{\cos^n\theta}$ then show that $\left(\frac{dy}{dx}\right)^2 = n^2\left(\frac{y^2+4}{x^2+4}\right)$

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217. Show the dy/dx is independent of t if.

$x = \cos^{-1}\frac{1}{\sqrt{t^2+1}}$ and $y = \sin^{-1}\frac{t}{\sqrt{t^2+1}}$

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218. If $y\sqrt{x^2+1} = \log\left\{\sqrt{x^2+1} - x\right\}$ then prove that $\left(x^2+1\right)\frac{dy}{dx} + xy + 1 = 0$

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219. If $(a+bx)e^{\frac{y}{x}} = x$, then show that

$$x^3\frac{d}{dx}\left(\frac{dy}{dx}\right) = \left(x\frac{dy}{dx} - y\right)^2$$

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220. If $y = \tan^{-1} x,$ prove that

$$(1 + x^2)y_2 + 2xy_1 = 0$$

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221. If y = ax sin x show that

$$x^2 y_2 - 2xy_1 + (x^2 + 2)y = 0$$

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222. If $y = e^{m \cos^{-1} x}$ $(1 - x^2)y_2 - xy_1 = m^2 y$

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223. If x =sin t,y = sin 2t then prove that

$$(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + 4y = 0$$

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224. If $y = \left(\sin^{-1} x\right)^2$, prove that

$$(1-x^2)y_2 - xy_1 - 2 = 0$$

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225. If $y = \tan^{-1} x,$ prove that

$$(1 + x^2) y_2 + 2x y_1 = 0$$

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226. Verify Rolle's theorem for the function

$$f(x) = x(x - 2)^2, 0 \leq x \leq 2$$

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227. Examine if Rolle's theorem is applicable to the following functions :

$f(x) = |x| on [-1, 1]$

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228. Examine if Rolle's theorem is applicable to the following functions :

$f(x) = [x] on [-1, 1]$

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229. Examine if Rolle's theorem is applicable to the following functions :

$f(x) = \sin x on [0, \pi]$

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230. Examine if Rolle's theorem is applicable to the following functions :

$f(x) = \cos x on [0, \pi]$

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231. Verify lagrange's Mean-Value theorem for

$F(x) = x^3 - 2x^2 - x + 3$ on [1,2]

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232. Verify Caunchy's mean value theorem for the functions x^2 and x^3 in [1,2]

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Question Type

1. Find the points where the following function are not differentiable.

$e^{|x|}$

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2. Find the points where the following function are not differentiable.

$|x^2 - 4|$

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3. Find the points where the following function are not differentiable.

$|x - 1| + |x - 2|$

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4. Find the points where the following function are not differentiable.

$\sin|x|$