MATHS

BOOKS - RD SHARMA MATHS (ENGLISH)

DIFFERENTIATION

Others

1. If $y = \sqrt{x + \sqrt{x + \sqrt{x + \ldots} \to \infty}}$, prove that $\dfrac{dy}{dx} = \dfrac{1}{2y - 1}$

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2. Differentiate the following function with respect to x: $x^{\sin^{-1}x}$

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3. Differentiate $\sin^{-1}\left(2ax\sqrt{1-a^2x^2}\right)$ with respect to $\sqrt{1-a^2x^2}$, if $-\dfrac{1}{\sqrt{2}} < ax < \dfrac{1}{\sqrt{2}}$

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4. Differentiate the following functions with respect to $e^{\sin\sqrt{x}}$

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5. Differentiate the function $\sin(\log x)$ with respect to x.

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6. Differentiate the following function $\sin^2(2x+1)$

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7. Differentiate the following function from first principles: $\sin^{-1}(2x + 3)$

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8. Differentiate the following functions with respect to $\sin(3x + 5)$

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9. Differentiate the following functions with respect to $\tan\left(x^0 + 45^0\right)$

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10. Differentiate the following function with respect to x:

$\cos^{-1}\left(\dfrac{1 - x^{2n}}{1 + x^{2n}}\right), 0 < x < \infty$

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11. Differentiate the following functions with respect to $\tan 5x^0$

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12. Differentiate the following functions with respect to $(\log)_7(2x - 3)$

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13. Differentiate the following function with respect to x: (i)$e^{x\log x}$ (ii) $10^{\log \sin x}$

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14. Differentiate the following function with respect to x: $x^{\cos^{-1}x}$

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15. Differentiate the following function with respect to x: $(\log x)^{\cos x}$

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16. Differentiate the following function with respect to x: $x^{\frac{1}{x}}$

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17. If $y = \sqrt{x^2 + a^2}$, prove that $y\dfrac{dy}{dx} - x = 0$

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18. If $y = e^x + e^{-x}$, prove that $\dfrac{dy}{dx} = \sqrt{y^2 - 4}$

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19. If $xy = 4$, prove, $x\left(\dfrac{dy}{dx} + y^2\right) = 3y$

20. Prove that $\dfrac{d}{dx}\left\{\dfrac{x}{2}\sqrt{a^2 - x^2} + \dfrac{a^2}{2}\sin^{-1}\left(\dfrac{x}{a}\right)\right\} = \sqrt{a^2 - x^2}$

21. Differentiate the following with respect to x: $\cos^{-1}(\sin x)$ and

$\cot^{-1}\left(\dfrac{1 - x}{1 + x}\right)$

22. If $y = \sin^{-1}\left(\dfrac{2x}{1 + x^2}\right) + \sec^{-1}\left(\dfrac{1 + x^2}{1 - x^2}\right)$, $0 < x < 1$, prove that

$\dfrac{dy}{dx} = \dfrac{4}{1 + x^2}$

23. Differentiate the following function with respect to x: $\tan^{-1}\left(\dfrac{x}{1 + 6x^2}\right)$

24. If $y = \cot^{-1}\left\{\dfrac{\sqrt{1 + \sin x} + \sqrt{1 - \sin x}}{\sqrt{1 + \sin x} - \sqrt{1 - \sin x}}\right\}$. Show that $\dfrac{dy}{dx}$ is independent of x.

25. Find $\dfrac{dy}{dx}$, when $x = \dfrac{e^t + e^{-t}}{2}$ and $y = \dfrac{e^t - e^{-t}}{2}$

26. Find $\dfrac{dy}{dx}$, when $x = ae^{\theta}(\sin\theta - \cos\theta),\ y = ae^{\theta}(\sin\theta + \cos\theta)$

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27. Find $\dfrac{dy}{dx}$, when $x = a(\theta + \sin\theta)$ and $y = a(1 - \cos\theta)$

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28. Differentiate the following function with respect to x: $\tan^{-1}\left(\dfrac{a + x}{1 - ax}\right)$

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29. Find $\dfrac{dy}{dx}$, when $x = \dfrac{3at}{1 + t^2}$ and $y = \dfrac{3at^2}{1 + t^2}$

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30. Differentiate the following function with respect to x:

$$\tan^{-1}\left(\frac{a + b\tan x}{b - a\tan x}\right)$$

31. Find $\dfrac{dy}{dx}$, $y = e^x + 10^x + x^x$

32. Differentiate the following function with respect to x:

$$\tan^{-1}\left\{\frac{\sqrt{1 + a^2x^2} - 1}{ax}\right\}, x \neq 0$$

33. Differentiate the following function with respect to x:

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

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34. Differentiate the following function with respect to x: $\sin\left(x^x\right)$

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35. Differentiate the following function with respect to x : $(\log x)^{\log x}$

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36. Differentiate the following function with respect to x: $10^{\log \sin x}$

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37. If $y = \log\sqrt{\dfrac{1 + \tan x}{1 - \tan x}}$, Prove that $\dfrac{dy}{dx} = \sec 2x$

38. If $y = \log\left(\sqrt{x} + \sqrt{\dfrac{1}{x}}\right)$, prove that $\dfrac{dy}{dx} = \dfrac{x - 1}{2x(x + 1)}$

39. If $y = \dfrac{x}{x + 2}$, prove that $x\dfrac{dy}{dx} = (1 - y)y$

40. Find $\dfrac{dy}{dx}$, $y = (\sin x)^{\cos x} + (\cos x)^{\sin x}$

41. If $y = (x - 1)\log(x - 1) - (x + 1)\log(x + 1)$, $prove: \dfrac{dy}{dx} = \log\left(\dfrac{x-1}{1+x}\right)$

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42. If $y = \dfrac{e^x - e^{-x}}{e^x + e^{-x}}$, prove that $\dfrac{dy}{dx} = 1 - y^2$

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43. If $y = \dfrac{x\sin^{-1}x}{\sqrt{1 - x^2}}$, prove that $(1 - x^2)\dfrac{dy}{dx} = x + \dfrac{y}{x}$

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44. Differentiate the following function $\tan^2 x$

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45. If $x^y y^{.x} = 1$, $prove that \dfrac{dy}{dx} = -\left(y\dfrac{y + x\log y}{x(y\log x + x)}\right)$

46. If $xy^2 = 1$, $prove that 2\dfrac{dy}{dx} + y^3 = 0$

47. Find $\dfrac{dy}{dx}$ in each of the following: $e^{x-y} = \log\left(\dfrac{x}{y}\right)$

48. Find $\dfrac{dy}{dx}$ in each of the following: $\sin xy + \cos(x + y) = 1$

49. If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$, prove that $\dfrac{dy}{dx} = \sqrt{\dfrac{1-y^2}{1-x^2}}$

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50. If $y\sqrt{1-x^2} + x\sqrt{1-y^2} = 1$, prove that $\dfrac{dy}{dx} = -\sqrt{\dfrac{1-y^2\cdot}{1-x^2}}$

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51. Differentiate the following function with respect to x: $\cos^{-1}\sqrt{\dfrac{1+x}{2}}$,

$-1 < x < 1$

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52. Differentiate the following function with respect to x: `cos^(-1)`

{2xsqrt(1-x^2)},1/(sqrt(2))

53. If $\sec\left(\dfrac{x+y}{x-y}\right) = a$, prove that $\dfrac{dy}{dx} = \dfrac{y}{x}$.

54. Differentiate the following function with respect to x:

$\sin^{-1}\left(2x^2 - 1\right), 0 < x < 1$

55. Differentiate the following function with respect to x:

$\tan^{-1}\left\{\dfrac{x}{\sqrt{a^2 - x^2}}\right\}, -a < x < a$

56. If `x=sin^(-1)[(2t)/(1+t^2)]'and'y=tan^(-1)((2t)/(1-t^2)), prove that dy/dx=1'.

57. If $x^{13}y^7 = (x + y)^{20}$, $provethat\dfrac{dy}{dx} = \dfrac{y\cdot}{x}$

58. Find $\dfrac{dy}{dx}$, when $x = \dfrac{\cos^{-1}1}{\sqrt{1 + t^2}}$ $andy = \dfrac{\sin^{-1}1}{\sqrt{1 + t^2}}$, tR

59. If $x = 2\cos\theta - \cos2\theta$ $andy = 2\sin\theta - \sin2\theta$ Prove that $\dfrac{dy}{dx} = \tan\left(\dfrac{3\theta}{2}\right)\cdot$

60. If $x = \cos t$ and $y = \sin t$, prove : $\dfrac{dy}{dx} = \dfrac{1}{\sqrt{3}}$ at $t = \dfrac{2\pi}{3}$

61. Differentiate the following functions with respect to $\cos(\log x)\hat{2}$

62. Differentiate the following functions with respect to $e^{ax}\sec x \tan 2x$

63. Differentiate the following functions with respect to x : (i)$\log\left(\cos x^2\right)$

(ii) $\cos(\log x)^2$

64. Find $\dfrac{dy}{dx}$, $y = x^x + x^{\frac{1}{x}}$

65. Differentiate the following function $3e^{-3x}\log(1 + x)$

66. Differentiate the following functions with respect to $\dfrac{x^2 + 2}{\sqrt{\cos x}}$

67. If $y = \log\left\{\sqrt{x - 1} - \sqrt{x + 1}\right\}$, show that $\dfrac{dy}{dx} = \dfrac{-1}{2\sqrt{x^2 - 1}}$

68. Find $\dfrac{dy}{dx}$ in each of the following: $4x + 3y = \log(4x - 3y)$

69. Find $\dfrac{dy}{dx}$ **in each of the following:** $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$

70. Find $\dfrac{dy}{dx}$ **in each of the following:** $xy = c^2$

71. Differentiate the following function with respect to x :

$$\cos^{-1}\left\{ \frac{x + \sqrt{1 - x^2}}{\sqrt{2}} \right\}; \ -1 < x < 1$$

72. Differentiate the following function with respect to x:

$$\sin^{-1}\left\{ \frac{x + \sqrt{1 - x^2}}{\sqrt{2}} \right\}, -1 < x < 1$$

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73. Differentiate the following function with respect to x: $\tan^{-1}\left(\frac{2^{x+1}}{1 - 4^x} \right)$,

$0 < x < \infty$

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74. Differentiate the following function with respect to x:

$$\sin^{-1}\left\{ \frac{\sin x + \cos x}{\sqrt{2}} \right\}, -\frac{3\pi}{4} < x < \frac{\pi}{4}$$

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75. Differentiate the following function with respect to x:

$\tan^{-1}\left(\dfrac{x}{1 + \sqrt{1 - x^2}}\right)$, $-1 < x < 1$

76. Differentiate the following functions with respect to $3^{x^2 + 2x}$

77. Differentiate the following function from first principles: e^{3x}

78. Differentiate the following functions with respect to 3^{e^x}

79. Differentiate the following function with respect to `x : sin^(-1)`

{(sqrt(1+x)+sqrt(1-x))/2} ,0

80. Differentiate the following functions with respect to $\sqrt{\dfrac{1-x^2}{1+x^2}}$

81. Differentiate the following functions with respect to $e^{\tan x}$

82. Differentiate the following function $\sin^{-1}\left(\dfrac{x}{x^2 + a^2}\right)$

83. If $y = \sqrt{\cos x + \sqrt{\cos x + \sqrt{\cos x + \ldots}}} \to \infty$, prove that $\dfrac{dy}{dx} = \dfrac{\sin x}{1 - 2y}$

84. If $y = (\sin x)^{(\sin x)^{(\sin x)^{\cdots^{\infty}}}}$, prove that $\dfrac{dy}{dx} = \dfrac{y^2 \cos x}{(1 - y \log \sin x)}$

85. Differentiate the following function from first principles: $\log \cos x$

86. If $y = e^{x^{e^x}} + x^{e^{e^x}} + e^{x^{x^e}}$, prove that

$\dfrac{dy}{dx} = e^{x^{e^x}} \cdot x^{e^x} \left\{ \dfrac{e^x}{x} + e^x . \log x \right\} + x^{e^{e^x}} . e^{e^x} \left\{ \dfrac{1}{x} + e^x \log x \right\} + e^{x^{x^e}} . x^{x^e} . x^{e-1} \{1 + e \log x\}$

87. Find $\dfrac{dy}{dx}$, $y = e^{3x}\sin 4x.\ 2^x$

88. Differentiate the following function from first principles: $e^{\sqrt{\cot x}}$

89. Differentiate the following function $\dfrac{\sqrt{x^2 + 1} + \sqrt{x^2 - 1}}{\sqrt{x^2 + 1} - \sqrt{x^2 - 1}}$

90. Differentiate the following functions with respect to $\left(\sin^{-1}x^4\right)^4$

91. Find $\dfrac{dy}{dx}$, $y = \dfrac{\left(x^2 - 1\right)^3 (2x - 1)}{\sqrt{(x - 3)(4x - 1)}}$

92. If $\sqrt{y + x} + \sqrt{y - x} = c$,show that $\dfrac{dy}{dx} = \dfrac{y}{x} - \sqrt{\dfrac{y^2}{x^2} - 1}.$

93. If $(\sin x)^y = (\cos y)^x$, $prove that \dfrac{dy}{dx} = \dfrac{\log \cos y - y \cot x}{\log \sin x + x \tan y}$

94. If $y = \cos^{-1}\left\{ \dfrac{2x - 3\sqrt{1 - x^2}}{\sqrt{13}} \right\}$, $f\,i\,n\,d\,\dfrac{dy}{dx}$

95. If $e^x + e^y = e^{x+y}$, prove that $\dfrac{dy}{dx} + e^{y-x} = 0$

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96. If $x\sin(a + y) + \sin a \cos(a + y) = 0$, prove that $\dfrac{dy}{dx} = \dfrac{\sin^2(a + y)}{\sin a}$

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97. Find $\dfrac{dy}{dx}$ in each of the following: $\left(x^2 + y^2\right)^2 = xy$

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98. Differentiate the following functions $\dfrac{2^x \cos x}{\left(x^2 + 3\right)^2}$ with respect to x,

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99. Differentiate the following functions with respect to $e^{\sin}$ ∧ ((- 1)2x)

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100. Differentiate the function $\sin\left(2\sin^{-1}x\right)$ with respect to x.

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101. Differentiate the following function $\sqrt{\tan^{-1}\left(\dfrac{x}{2}\right)}$ with respect to x

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102. Differentiate the following function $\tan^{-1}\left(e^x\right)$ with respect to x

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103. Differentiate $\tan^{-1}\left(\dfrac{1 + ax}{1 - ax}\right)$ with respect to $\sqrt{1 + a^2x^2}$.

104. Differentiate $\tan^{-1}\left(\dfrac{x - 1}{x + 1}\right)$ with respect to $\sin^{-1}\left(3x - 4x^3\right)$, if -1/2

105. If $y = \left\{\log_{\cos x}\sin x\right\}\left\{\log_{\sin x}\cos x\right)^{-1} + \sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$, find $\dfrac{dy}{dx} atx = \dfrac{\pi}{4}$

106. If $y = \sec^{-1}\left(\dfrac{x + 1}{x - 1}\right) + \sin^{-1}\left(\dfrac{x - 1}{x + 1}\right)$, $x > 0$. Find $\dfrac{dy}{dx}$

107. Differentiate $\tan^{-1}\left(\dfrac{x}{\sqrt{1-x^2}}\right)$ with respect to $\sin^{-1}\left(2x\sqrt{1-x^2}\right)$, if

$-\dfrac{1}{\sqrt{2}} < x < \dfrac{1}{\sqrt{2}}$

108. Differentiate $\sin^{-1}\sqrt{1-x^2}$ with respect to $\cot^{-1}\left(\dfrac{x}{\sqrt{1-x^2}}\right)$ if $0<x<1$

109. If $y\sqrt{x^2+1} = \log\left(\sqrt{x^2+1}-x\right)$, $showthat\left(x^2+1\right)\dfrac{dy}{dx} + xy + 1 = 0$

110. If $e^x + e^y = e^{x+y}$, prove that $\dfrac{dy}{dx} = -\dfrac{e^x\left(e^y-1\right)}{e^y\left(e^x-1\right)}$ or, $\dfrac{dy}{dx} + e^{y-x} = 0$

111. If $y = x\sin(a + y)$, prove that $\dfrac{dy}{dx} = \dfrac{\sin^2(a + y)}{\sin(a + y) - y\cos(a + y)}$.

112. If $xy\log(x + y) = 1$, prove that $\dfrac{dy}{dx} = -\dfrac{y\left(x^2y + x + y\right)}{x\left(xy^2 + x + y\right)}$

113. If $y = (\sin x - \cos x)^{\sin x - \cos x}, \dfrac{\pi}{4} < x < \dfrac{3\pi}{4}$ find dy/dx

114. If $y = \log\left(\dfrac{x^2 + x + 1}{x^2 - x + 1}\right) + \dfrac{2}{\sqrt{3}}\tan^{-1}\left(\dfrac{\sqrt{3}x}{1 - x^2}\right)$, find $\dfrac{dy}{dx}$

115. If $(x - y)e^{\frac{x}{x-y}} = a$, prove that $\dfrac{dy}{dx} + x = 2y$

116. Differentiate the following functions with respect to x : $\dfrac{e^x \log x}{x^2}$

117. Differentiate the following functions with respect to x:

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

118. Differentiate the following functions with respect to x : $\tan\left(e^{\sin x}\right)$

119. Differentiate $\sin^{-1}\left\{\dfrac{2^{x+1}.3^x}{1+(36)^x}\right\}$ w i t h r e s p e c tt o x$\overset{.}{}$

120. Differentiate the following functions with respect to x: $\log\left(\dfrac{\sin x}{1+\cos x}\right)$

121. If $y = \tan^{-1}\left\{\dfrac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right\}$, f i n d $\dfrac{dy}{dx}$

122. Differentiate the following function $\sqrt{\dfrac{1+\sin x}{1-\sin x}}$

123. If the derivative of $\tan^{-1}(a + bx)$ take the value of 1 at $x = 0$, prove that $1 + a^2 = \overset{.}{b}$

124. Differentiate the following functions with respect to x: $e^{3x}\cos2x$

125. If $y = \sin\left[2tan^{-1}\left\{\sqrt{\dfrac{1-x}{1+x}}\right\}\right]$, find $\dfrac{dy}{dx}$

126. Differentiate $(\log x)^x$ with respect to $\log\overset{.}{x}$

127. Differentiate $\log\left(1 + x^2\right)$ with respect to $\tan^{-1}x$.

128. Differentiate x^2 with respect to x^3.

129. Differentiate $\tan^{-1}\left(\dfrac{\sqrt{1 + x^2} - 1}{x}\right)$ with respect to $\sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$, if `-1

130. Differentiate $\sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$ with respect to $\tan^{-1}\left(\dfrac{2x}{1 - x^2}\right)$, if `-1

131. Differentiate $\sin^{-1}\sqrt{1-x^2}$ with respect to $\cos^{-1}x$, if (i)$x \in (0, 1)$ (ii) $x \in (-1, 0)$

132. Differentiate $(\cos x)^{\sin x}$ with respect to $(\sin x)^{\cos x}$

133. If $y = 1 + \dfrac{\alpha}{\left(\dfrac{1}{x} - \alpha\right)} + \dfrac{\beta/x}{\left(\dfrac{1}{x} - \alpha\right)\left(\dfrac{1}{x} - \beta\right)} + \dfrac{\gamma/x^2}{\left(\dfrac{1}{x} - \alpha\right)\left(\dfrac{1}{x} - \beta\right)\left(\dfrac{1}{x} - \gamma\right)}$, find $\dfrac{dy}{dx}$

134. Differentiate the following functions with respect to $(\log)_x 3$

135. Differentiate the following function from first principles: e^{-x}

136. Differentiate the following functions with respect to $2^x \wedge 3$

137. Differentiate the following function from first principles: e^{ax+b}

138. Differentiate the following function from first principles: $e^{\cos x}$

139. Differentiate the following function from first principles: $e^{\sqrt{2x}}$

140. Differentiate the following function $\sqrt{\dfrac{a^2 - x^2}{a^2 + x^2}}$

141. Differentiate the functions $3^{x\log x}$ with respect to x

142. Differentiate the following function from first principles: $x^2 e^x$

143. Differentiate the function $(\log \sin x)^2$ with respect to x

144. If $a > 0, x = \left(t + \dfrac{1}{t}\right)^a, y = a^{t + \frac{1}{t}}$, find $\dfrac{dy}{dx}$

145. If $x = a\left(\dfrac{1 + t^2}{1 - t^2}\right)$ and $y = \dfrac{2t}{1 - t^2}$, find $\dfrac{dy}{dx}$

146. If $x = a\sin 2t(1 + \cos 2t)$ and $y = b\cos 2t(1 - \cos 2t)$, show that at $\dfrac{\pi}{4}, \dfrac{dy}{dx} = \dfrac{b \cdot}{a}$

147. If $x = \dfrac{1 + \log t}{t^2}, y = \dfrac{3 + 2\log t}{t}$, find $\dfrac{dy}{dx}$.

148. If $x = 3\sin t - \sin 3t, y = 3\cos t - \cos 3t$, find $\dfrac{dy}{dx}$ at $t = \dfrac{\pi}{3}$.

149. If $\sin x = \dfrac{2t}{1 + t^2}, \tan y = \dfrac{2t}{1 - t^2}$, find $\dfrac{dy}{dx}$.

150. Differentiate $\tan^{-1}\left(\dfrac{\cos x}{1 + \sin x}\right)$ with respect to $\sec^{-1} x$.

151. If $\cos y = x\cos(a + y)$, with $\cos a \neq \pm 1$, prove that $\dfrac{dy}{dx} = \dfrac{\cos^2(a + y) \cdot}{\sin a}$

152. If $f(x) = (\log)_{x^2}(\log x)$, then $f'(x)$ at $x = e$ is 0 (b) 1 (c) $\dfrac{1}{e}$ (d) $\dfrac{1}{2}e$

153. The derivative of the function $\cot^{-1}\left\{(\cos 2x)^{\frac{1}{2}}\right\} at x = \dfrac{\pi}{6}$ is $\left(\dfrac{2}{3}\right)^{\frac{1}{2}}$ (b) $\left(\dfrac{1}{3}\right)^{\frac{1}{2}}$ (c) $3^{\frac{1}{2}}$ (d) $6^{\frac{1}{2}}$

154. If $f(x), g(x) and h(x)$ are three polynomials of degree 2, then prove that $\varphi(x) = \left|\begin{matrix} f(x) g(x) h(x) f'(x) g'(x) h'(x) f^x g^x h^x \end{matrix}\right| is a constant polynomial$

155. If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \dfrac{3\pi}{2}$, then find the value of $x^2 + y^2 + z^2$

156. If $3\sin(xy) + 4\cos(xy) = 5$ then $\dfrac{dy}{dx} =$

157. If $f(x) = \left(\dfrac{x^l}{x^m}\right)^{l+m}\left(\dfrac{x^m}{x^n}\right)^{m+n}\left(\dfrac{x^n}{x^l}\right)^{n+l}$, then $f'(x)$

158. $\dfrac{d}{dx}\left\{\tan^{-1}\left(\dfrac{\cos x}{1+\sin x}\right)\right\} equal \dfrac{1}{2}$ (b) x (c) $\dfrac{1-x^2}{1+x^2}$ (d) 1

159. If $y = \sqrt{\sin x + y}$ then $\dfrac{dy}{dx} =$ (a) $\dfrac{\sin x}{2y - 1}$ (b) $\dfrac{\sin x}{1 - 2y}$ (c) $\dfrac{\cos x}{1 - 2y}$ (d) $\dfrac{\cos x}{2y - 1}$

160. If $y = \dfrac{1}{1 + x^{a-b} + x^{c-b}} + \dfrac{1}{1 + x^{b-c} + x^{a-c}} + \dfrac{1}{1 + x^{b-a} + x^{c-a}}$, then

(dy)/(dx) is equal to (a)1 (b) $(a + b + c)^{x+b+c-1}$ 0 (d) none of these

161. If $\sin^{-1}\left(\dfrac{x^2 - y^2}{x^2 + y^2}\right) = \log a$ then $\dfrac{dy}{dx}$ is equa $< o$ $\dfrac{x^2 - y^2}{x^2 + y^2}$ (b) $\dfrac{y}{x}$ (c) $\dfrac{x}{y}$ (d) none

of these

162. If $(1 + x)^n = c_0 + C_1 x + C_2 x^2 + + C_n x^n$,using derivative prove that

$C_1 + 2C_2 + + nC_n = n.2^{n-1}$ $C_1 - 2C_2 + 3C_3 + + (-1)^{n-1} nC_n = 0$

163. Differentiate the following function with respect to x, $\tan\left(x^0 + 45^0\right)$

164. If $y = \left\{x + \sqrt{x^2 + a^2}\right\}^n$, then prove that $\dfrac{dy}{dx} = \dfrac{ny}{\sqrt{\left(x^2 + a^2\right)}}$

165. If $y = \dfrac{x\sin^{-1}x}{\sqrt{1 - x^2}} + \log\sqrt{1 - x^2}$, then prove that $\dfrac{dy}{dx} = \dfrac{\sin^{-1}x}{\left(1 - x^2\right)^{\frac{3}{2}}}$

166. Differentiate the following functions with respect to x:

$\log(\sec x + \tan x)$ (ii) $e^{x\sin x} \sin^{-1}(x^3)$ (iv) $\sin^{-1}\left(\dfrac{a + b\cos x}{b + a\cos x}\right)$, $b > a$

167. Differentiate the following functions with respect to x: $\sec\left(\log x^n\right)$ (ii)

$\log\tan\left(\dfrac{\pi}{4} + \dfrac{x}{2}\right)\sqrt{\log\left\{\sin\left(\dfrac{x^2}{3} - 1\right)\right\}}$

168. If $y = \sqrt{\dfrac{1 - x}{1 + x}}$ prove that $\left(1 - x^2\right)\dfrac{dy}{dx} + y = 0$

169. If $y = \sqrt{\dfrac{1 + e^x}{1 - e^x}}$, $show\,that\,\dfrac{dy}{dx} = \dfrac{e^x}{\left(1 - e^x\right)\sqrt{1 - e^{2x}}}$

170. Differentiate the following functions with respect to x:

$(\log)_{10}x + (\log)_x 10 + (\log)_x + (\log)_{10}10$

171. If $= \dfrac{\sqrt{a^2 + x^2} + \sqrt{a^2 - x^2}}{\sqrt{a^2 + x^2} - \sqrt{a^2 - x^2}}$, show that $\dfrac{dy}{dx} = \dfrac{2a^2}{x^3}\left\{1 + \dfrac{a^2}{\sqrt{a^4 - x^4}}\right\}$.

172. Differentiate $\tan^{-1}\left(\dfrac{\sqrt{1 + x^2} - 1}{x}\right)$ with respect to $\tan^{-1}x, x \neq 0$.

173. Differentiate $\tan^{-1}\left(\dfrac{1+2x}{1-2x}\right)$ *withrespeco*$\sqrt{1+4x^2}$

174. Differentiate x^x with respect to $x\log x$

175. Differentiate $\sin^{-1}\left(\dfrac{2x}{1+2x}\right)$ wrt to `tan^(-1)x , -1

176. If $x = \sec\theta - \cos\theta$ and $y = \sec^n\theta - \cos^n\theta$ then show that

$$\left(x^2 + 4\right)\left(\dfrac{dy}{dx}\right)^2 = n^2\left(y^2 + 4\right)$$

177. If $u = \sin\left(m\cos^{-1}x\right)$, $v = \cos\left(m\sin^{-1}x\right)$, $provethat\dfrac{du}{dv} = \sqrt{\dfrac{1-u^2}{1-v^2}}$

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178. Differentiate $\log\sin x \, with respect \rightarrow \sqrt{\cos x}$.

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179. Find $\dfrac{dy}{dx}$, $when \; x = e^\theta\left(\theta + \dfrac{1}{\theta}\right) and y = e^{-\theta}\left(\theta - \dfrac{1}{\theta}\right)$

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180. If $f(x) = \left|x + a^2abacabx + b^2bcacx + c^2\right|, f \in df'(x)$

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181. Differentiate $\tan^{-1}\left\{ \dfrac{\sqrt{1+x^2} - \sqrt{1-x^2}}{\sqrt{1+x^2} + \sqrt{1-x^2}} \right\}$ with respect to $\cos^{-1}x^2$

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182. Differentiate the following functions with respect to x: $\left(x^2 + x + 1\right)^4$

$\sqrt{x^2 + x + 1}$ (iii) $\sin^3 x$ (iv) $\dfrac{1}{\sqrt{a^2 - x^2}}$

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183. Differentiate the following functions with respect to x: (i)$\log\sin x^2$

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184. Differentiate $\log \sin x$ from first principle.

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185. If $f(x) = |\log x|, x > 0$, find $f'\left(\dfrac{1}{e}\right)$ and $f'(e)$

186. Differentiate $\sin^{-1}\sqrt{x}(0 < x < 1)$ from first principles.

187. Differentiate $\cos^{-1}(2x + 3)$ from first principles.

188. Differentiate the following functions with respect to x: $\dfrac{2^2\cot x}{\sqrt{x}}$ (ii) $e^x\log\sqrt{x}\tan x$

189. If $f(x) = |\cos x - \sin x|$, find $f'\left(\dfrac{\pi}{6}\right)$ and $f'\left(\dfrac{\pi}{3}\right)$.

190. If $y = (1 + x)\left(1 + x^2\right)\left(1 + x^4\right)\left(1 + x^8\right)\ldots\ldots\ldots\left(1 + x^{2n}\right)$, find dy/dx

$at\, x = 0$

191. If $x = a\sec^3\theta$ and $y = a\tan^3\theta$, find $\dfrac{dy}{dx}$ at $\theta = \dfrac{\pi}{3}$

192. If $x = \sin^{-1}\left(\dfrac{2t}{1 + t^2}\right)$ and $y = \tan^{-1}\left(\dfrac{2t}{1 - t^2}\right), t > 1.$ Prove that $\dfrac{dy}{dx} = -1$

193. If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + }}} \to \infty$, prove that $\dfrac{dy}{dx} = \dfrac{\cos x}{2y - 1}$

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194. If $y = a^{x^{a^{x^{\cdots\cdots \wedge \infty}}}}$, prove that $\dfrac{dy}{dx} = \dfrac{y^2 \log y}{x\left(1 - y \log x \log y\right)}$

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195. If $y = e^{x + e^{x + e^{\left(\left(\left(\left(\to \infty\right)\right)\right)\right)}}}$, show that $\dfrac{dy}{dx} = \dfrac{y}{1 - y}$

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196. If $y = \left(\sqrt{x}\right)^{\sqrt{x}} \wedge \sqrt{x} \wedge \left(\left(\left(\infty\right)\right)\right)$, show that $\dfrac{dy}{dx} = \dfrac{y^2}{x(2 - y \log x)}$

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197. If $y = x + \cfrac{1}{x + \cfrac{1}{x + \cfrac{1}{x +}}}$, $prove that \dfrac{dy}{dx} = \dfrac{y}{2y - x}$

198. If $y = \cfrac{\sin x}{1 + \cfrac{\cos x}{1 + \cfrac{\sin x}{1 + \frac{\cos x}{1 + \to \infty}}}}$, $prove that \dfrac{dy}{dx} = \dfrac{(1 + y)\cos x + y\sin x}{1 + 2y + \cos x - \sin x}$

199. If $e^x + e^y = e^{x+y}$, prove that $\dfrac{dy}{dx} = -\dfrac{e^x\left(e^y - 1\right)}{e^y\left(e^x - 1\right)}$

200. If $y = (\cos x)^{\left((\cos x)^{\left((\cos x)^{(\ldots\ \infty)}\right)}\right)}$ prove that $\dfrac{dy}{dx} = -\dfrac{y^2\tan x}{1 - y\log\cos x}$

201. If $y = \sqrt{\sin x + y}$, write $\dfrac{dy}{dx}$.

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202. If $y = x^x \wedge x^{\overset{..}{\wedge}}((((\infty))))$, $\dfrac{dy}{dx}$ is

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203. If $y = x^{\tan x} + \sqrt{\dfrac{x^2 + 1}{2}}, f \in d\dfrac{dy}{dx}$

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204. If $x^y = y^x$, then find $\dfrac{dy}{dx}$

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205. If $(\sin x)^y = (\cos y)^x$, prove that $\dfrac{dy}{dx} = \dfrac{\log \cos y - y \cot x}{\log \sin x + x \tan y}$

206. If $y^x = e^{y-x}$, then prove that $\dfrac{dy}{dx} = \dfrac{(1 + \log y)^2}{\log y}$

207. If $y = \dfrac{ax^2}{(x-a)(x-b)(x-c)} + \dfrac{bx}{(x-b)(x-c)} + \dfrac{c}{x-c} + 1$ then $\dfrac{y'}{y} =$

208. If $x = e^{\frac{x}{y}}$, prove that $\dfrac{dy}{dx} = \dfrac{x-y}{x \log x}$

209. If $y = x\sin y$, prove that $\dfrac{dy}{dx} = \dfrac{y}{x(1 - x\cos y)}$

210. If $xy\log(x + y) = 1$, prove that $\dfrac{dy}{dx} = -\dfrac{y\left(x^2 y + x + y\right)}{x\left(xy^2 + x + y\right)}$

211. If $(\sin x)^y = x + y$, $prove that \dfrac{dy}{dx} = \dfrac{1 - (x + y)y\cot x}{(x + y)\log\sin x - 1}$

212. Differentiate: $(\log x)^x + x^{\log x} with respect \rightarrow x$:

213. Find the derivative of $\dfrac{\sqrt{x}(x+4)^{\frac{3}{2}}}{(4x-3)^{\frac{4}{3}}}$ with respect to x:

214. Differentiate the following functions with respect to x: $(\cos x)^x$ (ii) $x^{\sqrt{x}}(\log x)^{\sin x}$ (iv) $(\sin x)^{\cos x}$

215. Differentiate the following functions with respect to x: (i) $\left(x^x\right)^x$

216. If $y = \left\{(\log)_{\cos x}\sin x\right\}\left\{(\log)_{\sin x}\cos x\right\}^{-1} + \sin^{-1}\left(\dfrac{2x}{1+x^2}\right)$, fin d $\dfrac{dy}{dx}atx = \dfrac{\pi}{4}$

217. If $\sqrt{y + x} + \sqrt{y - x} = c$, showthat $\dfrac{dy}{dx} = \dfrac{y}{x} - \sqrt{\dfrac{y^2}{x^2} - 1}$.

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218. If $y = \cos^{-1} \sqrt{\dfrac{\cos 3x}{\cos^3 x}}$, thenshowthat $\dfrac{dy}{dx} = \sqrt{\dfrac{3}{\cos x \cos 3x}}$

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219. If $\sqrt{1 - x^2} + \sqrt{1 - y^2} = a(x - y)$, provethat $\dfrac{dy}{dx} = \sqrt{\dfrac{1 - y^2}{1 - x^2}}$

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220. if $x^2 + y^2 = t - \dfrac{1}{t}$ and $x^4 + y^4 = t^2 + \dfrac{1}{t^2}$ then prove that `dy/dx = x^3y`

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221. If $y = b\tan^{-1}\left(\dfrac{x}{a} + \dfrac{\tan^{-1}y}{x}\right)$, find $\dfrac{dy}{dx}$

222. Differentiate $\sin^{-1}\left(\dfrac{2x}{1+x^2}\right) + \cos^{-1}\left(\dfrac{1-x^2}{1+x^2}\right)$ with respect to x, if $x \in (0, 1)$

223. Differentiate $\sin^{-1}\left(\dfrac{2x}{1+x^2}\right) + \cos^{-1}\left(\dfrac{1-x^2}{1+x^2}\right)$ with respect to x, if $x \in (-1, 0)$

224. Differentiate the functions with respect to x:

$$\tan^{-1}\left\{\frac{\sqrt{1 + a^2x^2} - 1}{ax}\right\}, x \neq 0$$

225. Differentiate the functions with respect to x:

$$\cos^{-1}\left\{\frac{\cos x + \sin x}{\sqrt{2}}\right\}, -\frac{\pi}{4} < x < \frac{\pi}{4}$$

226. If the derivative of $\tan^{-1}(a + bx)$ takes the value 1 at $x = 0$, prove that

$$1 + a^2 = b$$

227. If $y = \sin\left[2\tan^{-1}\left\{\sqrt{\dfrac{1-x}{1+x}}\right\}\right]$, find $\dfrac{dy}{dx}$

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228. If $\log\left(x^2 + y^2\right) = 2\tan^{-1}\left(\dfrac{y}{x}\right)$, show that $\dfrac{dy}{dx} = \dfrac{x+y}{x-y}$.

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229. If $y = \cos^{-1}(2x) + 2\cos^{-1}\sqrt{1-4x^2}$,

$-\dfrac{1}{2} < x < 0$, find $\dfrac{dy}{dx}$

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230. If $\sqrt{1-x^6} + \sqrt{1-y^6} = a\left(x^3 - y^3\right)$, $prove that \dfrac{dy}{dx} = \dfrac{x^2}{y^2}\sqrt{\dfrac{1-y^6}{1-x^6}}$ `where -1

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231. If $\cos^{-1}\left(\dfrac{x^2 - y^2}{x^2 + y^2}\right) = \tan^{-1}a$, prove that $\dfrac{dy}{dx} = \dfrac{y}{x}$.

232. Differentiate $\cos^{-1}\left(2x^2 - 1\right)$ with respect to x, if `0

233. Differentiate $\tan^{-1}\left(\dfrac{3x - x^3}{1 - 3x^2}\right)$, if `-1/(sqrt(3))

234. Differentiate each of the following functions with respect to x: (i)

$\sin^{-1}\left(2x\sqrt{1 - x^2}\right), \ -\dfrac{1}{\sqrt{2}} < x < \dfrac{1}{\sqrt{2}}$(ii) $\cos^{-1}\left(2x\left(\sqrt{1 - x^2}\right)\right), \ -\dfrac{1}{\sqrt{2}} < x < \dfrac{1}{\sqrt{2}}$

235. Differentiate the following function with respect to x:

$\sin^{-1}(\sin x), x \in [0, 2\pi]$ $\cos^{-1}(\cos x), x \in [0, 2\pi]$

$\tan^{-1}(\tan x), x \in [0, \pi] - \left\{\dfrac{\pi}{2}\right\}$

236. Differentiate $\sin^{-1}\left(2x\sqrt{1-x^2}\right) withrespec \otimes$, if $-\dfrac{1}{\sqrt{2}} < x < \dfrac{1}{\sqrt{2}}$

237. Differentiate $\sin^{-1}\left(3x - 4x^3\right)$ with respect to x, if (i)-$\dfrac{1}{2} < x < \dfrac{1}{2}$ (ii) $\dfrac{1}{2} < x < 1$(iii) $-1 < x < -\dfrac{1}{2}$

238. Differentiate $\cos^{-1}\left(2x^2 - 1\right)$ with respect to x, if `0

239. If `y=cos^(-1){xsqrt(1-x)+sqrt(x)sqrt(1-x^2)} and 0

240. If $y = \sqrt{a^2 - x^2}$, prove that $y\dfrac{dy}{dx} + x = 0$

241. If $y = e^x + e^{-x}$, p r o v et h a t $\dfrac{dy}{dx} = \sqrt{y^2 - 4}$

242. If $y = \sqrt{x^2 + a^2}$,prove that $y\dfrac{dy}{dx} - x = 0$

243. If $y = x\sin^{-1}x + \sqrt{1 - x^2}$, $provethat\dfrac{dy}{dx} = \sin^{-1}x$

244. If $y = \dfrac{1}{2}\log\left(\dfrac{1 - \cos2x}{1 + \cos2x}\right)$, $provethat\dfrac{dy}{dx} = 2\cosec2x$

245. If $y = xe^x$, find $\dfrac{dy}{dx}$

246. If $'y=(x-1)\log(x-1)-(x+1)\log(x+1)$, p rov et h a t$(dy)/(dx)=\log((x-1)/(1+x))$`

247. If $y = \sqrt{x} + \dfrac{1}{\sqrt{x}}, provethat2x\dfrac{dy}{dx} = \sqrt{x} - \dfrac{1}{\sqrt{x}}$

248. $Provethat\dfrac{d}{dx}\left\{\dfrac{x}{2}\sqrt{a^2 - x^2} + \dfrac{a^2}{2}\sin^{-1}\left(\dfrac{x}{a}\right)\right\} = \sqrt{a^2 - x^2}$

249. If $xy = 4, provethatx\left(\dfrac{dy}{dx} + y^2\right) = 3y$

250. Differentiate the following functions with respect to x:

$\tan^{-1}\sqrt{\dfrac{a - x}{a + x}}, \quad - a < x < a$

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251. Differentiate the following functions with respect to x: $\tan^{-1}\left(\dfrac{a + x}{1 - ax}\right)$

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252. Differentiate the following functions with respect to x:

$\tan^{-1}\left(\dfrac{3a^2x - x^3}{a^3 - 3ax^2}\right)$

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253. Differentiate the following functions with respect to x :

$\tan^{-1}\left(\dfrac{a + x}{1 - ax}\right)$ (ii) $\tan^{-1}\left(\dfrac{a\cos x - b\sin x}{b\cos x + a\sin x}\right), \ \text{-pi/2-1}$

254. Differentiate the following functions with respect to x :

$$\tan^{-1}\left\{\frac{1 - \cos x}{\sin x}\right\}, \quad -\pi < x < \pi$$

255. Differentiate the following functions with respect to x :

$$\tan^{-1}\left\{\sqrt{\frac{1 + \cos x}{1 - \cos x}}\right\}, 0 < x < \pi$$

256. Differentiate the following functions with respect to x :

$$\tan^{-1}\left\{\sqrt{\frac{1 + \cos x}{1 - \cos x}}\right\}, 0 < x < \pi$$

257. Differentiate the following functions with respect to x :

$$\tan^{-1}\left\{\frac{\cos x}{1 + \sin x}\right\}, \, 0 < x < \pi$$

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258. Differentiate the following functions with respect to x :

$$\tan^{-1}\left\{\sqrt{\frac{1 + \sin x}{1 - \sin x}}\right\}, \, -\frac{\pi}{2} < x < \frac{\pi}{2}$$

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259. Differentiate the following functions with respect to x :

$$\tan^{-1}(\sec x + \tan x), \, -\frac{\pi}{2} < x < \frac{\pi}{2}$$

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260. Differentiate the following functions with respect to x: $\tan^{-1}\sqrt{\dfrac{a-x}{a+x}}$

, $-a < x < a$

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261. Differentiate the following functions with respect to x: $\tan^{-1}\left(\dfrac{a+x}{1-ax}\right)$

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262. Differentiate the following functions with respect to x:

$\tan^{-1}\left(\dfrac{3a^2x - x^3}{a^3 - 3ax^2}\right)$

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263. $y = \tan^{-1}\left(\dfrac{a\cos x - b\sin x}{b\cos x + a\sin x}\right)$, where $-\dfrac{\pi}{2} < x < \pi$ and $\dfrac{a}{b}\tan x > -1$

264. Differentiate the following functions with respect to x :

$$\tan^{-1}\left\{\frac{1 - \cos x}{\sin x}\right\}, \ -\pi < x < \pi$$

265. Differentiate the following functions with respect to x :

$$\tan^{-1}\left\{\sqrt{\frac{1 + \cos x}{1 - \cos x}}\right\}$$

266. Differentiate the following functions with respect to x :

$$\tan^{-1}\left\{\sqrt{\frac{1 + \cos x}{1 - \cos x}}\right\}, 0 < x < \pi$$

267. Differentiate the following functions with respect to x :

$$\tan^{-1}\left\{\frac{\cos x}{1 + \sin x}\right\}, 0 < x < \pi$$

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268. Differentiate the following functions with respect to x :

$$\tan^{-1}\left\{\sqrt{\frac{1 + \sin x}{1 - \sin x}}\right\}, - pi/2ltxltpi/ 2`$$

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269. Differentiate the following functions with respect to x :

$$\tan^{-1}(\sec x + \tan x), \ -\frac{\pi}{2} < x < \frac{\pi}{2}$$

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270. Differentiate $\dfrac{2^x \cot x}{\sqrt{x}}$ with respect to x .

271. Differentiate $e^x \log\sqrt{x}\tan x$ with respect to x .

272. Differentiate $\dfrac{e^x + \sin x}{1 + \log x}$ with respect to x .

273. Differentiate $\dfrac{\sin x - x\cos x}{x\sin x + \cos x}$ with respect to x .

274. If $y = (1 + x)\left(1 + x^2\right)\left(1 + x^4\right)\left(1 + x^8\right).........\left(1 + x^{2n}\right)$, find $\dfrac{dy}{dx}$.

275. If $f(x) = |\cos x|$, find $f'\left(\dfrac{\pi}{4}\right)$ and $f'\left(\dfrac{3\pi}{4}\right)$.

276. If $f(x) = |\cos x - \sin x|$, find $f'\left(\dfrac{\pi}{6}\right)$ and $f'\left(\dfrac{\pi}{3}\right)$.

277. If $f(x) = |\log x|, x \; 0, f \in df'\left(\dfrac{1}{e}\right) and f'(e)$

278. Differentiate e^{x^2} with respect to x from first-principles

279. Differentiate e^{2x} with respect to x from first principles

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280. Differentiate $e^{\sqrt{x}}$ with respect to x from first-principles

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281. Differentiate $e^{\sin x}$ with respect to x from first-principles

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282. Differentiate xe^x from first principles.

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283. Find the derivative of the following function with respect to 'X' :

$\log \sin x$

284. Differentiate $\log \sec x$ from first principles.

285. If $f(x) = x \tan^{-1} x$, find $f'\left(\sqrt{3}\right)$ using the first principle.

286. Differentiate $\cos^{-1}(2x + 3)$ from first principles.

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288. Differentiate $x \tan^{-1} x$ from first principles.

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289. Differentiate `sin^(-1)sqrt(x)(0

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290. Differentiate e^{-x} from first principles

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291. Differentiate e^{3x} from the first principle.

292. Differentiate the following function from first principles: e^{ax+b}

293. Differentiate the following function from first principles: $e^{\cos x}$

294. Differentiate the following function from first principles: $e^{\sqrt{2x}}$

295. Differentiate the following function from first principles: $\log \cos x$

296. Differentiate the following function from first principles: $e^{\sqrt{\cot x}}$

297. Differentiate $x^2\, e^x$ from first principal:

298. Differentiate $\log \sin x$ from the first principles.

299. Differentiate the following function from first principles: $\sin^{-1}(2x + 3)$

300. Differentiate $\sin\left(x^2 + 1\right)$ with respect to x :

301. Differentiate $e^{\sin x}$ with respect to x :

302. Differentiate $\log \sin x$ with respect to x :

303. Differentiate $\log \sin x^2$ with respect to x :

304. Differentiate $e^{\sin x^2}$ with respect to x :

305. Differentiate $\sin\left(e^x \wedge 2\right)$ with respect to x :

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306. Differentiate $\left(x^2 + x + 1\right)^4$ with respect to x :

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307. Differentiate $\sqrt{x^2 + x + 1}$ with respect to x :

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308. Differentiate $\sin^3 x$ with respect to x :

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309. Differentiate $\dfrac{1}{\sqrt{a^2 - x^2}}$ with respect to x :

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310. Differentiate $\log(\sec x + \tan x)$ with respect to x :

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311. Differentiate $e^{x \sin x}$ with respect to x :

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312. Differentiate $\sin^{-1}\left(x^3\right)$ with respect to x :

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313. Differentiate the following w.r.t.x. $\sin^{-1}\left(\dfrac{a + b\cos x}{b + a\cos x}\right), b > a > 1$

314. Differentiate $e^{e} \wedge x$ with respect to x :

315. Differentiate $(\log)_7\left((\log)_7 x\right)$ with respect to x :

316. Differentiate $(\log)_x 2$ with respect to x :

317. Differentiate $\sec\left(\log x^n\right)$ with respect to x :

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318. Differentiate $\log\tan\left(\dfrac{\pi}{4} + \dfrac{x}{2}\right)$ with respect to x :

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319. Differentiate $\sqrt{\log\left\{\sin\left(\dfrac{x^2}{3} - 1\right)\right\}}$ with respect to x

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320. Differentiate $\log\left(x + \sqrt{a^2 + x^2}\right)$ with respect to x .

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321. Differentiate $\log\left\{\dfrac{a + b\sin x}{a - b\sin x}\right\}$ with respect to x.

322. Differentiate $\dfrac{e^x + e^{-x}}{e^x - e^{-x}}$ with respect to x.

323. Differentiate $\log\sqrt{\dfrac{1 + \sin x}{1 - \sin x}}$ with respect to x.

324. Find $\dfrac{dy}{dx}$, when $y = e^{ax}\cos(bx + c)$

325. Find $\dfrac{dy}{dx}$, when $y = \dfrac{e^x + \log x}{\sin 3x}$

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326. Find $\dfrac{dy}{dx}$, when $y = e^x \log\left(1 + x^2\right)$

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327. Find $\dfrac{dy}{dx}$, when $y = \dfrac{\sin x + x^2}{\cot 2x}$

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328. If $y = \left\{x + \sqrt{x^2 + a^2}\right\}^n$, then prove that $\dfrac{dy}{dx} = \dfrac{ny}{\sqrt{x^2 + a^2}}$.

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329. If $y = \dfrac{x\cos^{-1}x}{\sqrt{1 - x^2}} - \log\sqrt{1 - x^2}$, then prove that $\dfrac{dy}{dx} = \dfrac{\cos^{-1}x}{\left(1 - x^2\right)^{\frac{3}{2}}}$

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330. Differentiate $\sin\left(m \sin^{-1}x\right)$ with respect to x :

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331. Differentiate $\left(a^{\sin^{-1}x}\right)^2$ with respect to x :

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332. Differentiate: $e^{\cos^{-1}\sqrt{1-x^2}}$

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333. Differentiate the following functions with respect to x:

$(\log)_{10}x + (\log)_x 10 + (\log)_x + (\log)_{10}10 \ 5^3 - x^2 + \left(3 - x^2\right)^5$

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334. Differentiate $5^3 - x^2 + \left(3 - x^2\right)^5$ with respect to x :

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335. If $y = \dfrac{\sqrt{a^2 + x^2} + \sqrt{a^2 - x^2}}{\sqrt{a^2 + x^2} - \sqrt{a^2 - x^2}}$, $showthat\dfrac{dy}{dx} = \dfrac{2a^2}{x^3}\left\{a + \dfrac{a^2}{\sqrt{a^4 - x^4}}\right\}.$

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336. If $y = \sqrt{\dfrac{1 - x}{1 + x}}$ prove that $\left(1 - x^2\right)\dfrac{dy}{dx} + y = 0$

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337. If $y = \sqrt{\dfrac{1 + e^x}{1 - e^x}}$, showthat $\dfrac{dy}{dx} = \dfrac{e^x}{\left(1 - e^x\right)\sqrt{1 - e^{2x}}}$

338. If $(1 + x)^n = c_0 + C_1 x + C_2 x^2 + \ + C_n x^n$, us $\in$ gderivativesprovethat

$C_1 + 2C_2 + \ + nC_n = n.2^{n-1}$ $C_1 - 2C_2 + 3C_3 + \ + (-1)^{n-1} nC_n = 0$

339. Using the fact that $s \in (A + B) = s \in A \cos B + \cos A s \in B$ and the differentiation, obtain the sum formula for cosines.

340. If $f(x) = \sqrt{x^2 + 1}$, $g(x) = \dfrac{x + 1}{x^2 + 1}$ and $h(x) = 2x - 3$, then find $f'\left(h'\left(g'(x)\right)\right)$.

341. Differentiate $\sin(3x + 5)$ with respect to x :

342. Differentiate $tan^2 x$ with respect to x :

343. Differentiate $\tan(x + 45)$ with respect to x :

344. Differentiate $\sin(\log x)$ with respect to x :

345. Differentiate $e^{\sin\sqrt{x}}$ with respect to x :

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346. Differentiate $e^{\tan x}$ with respect to x :

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347. Differentiate $s \in^2 (2x + 1)$ with respect to x :

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348. Differentiate $(\log)_7(2x - 3)$ with respect to x :

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349. Differentiate $\tan 5x$ with respect to x :

350. Differentiate 2^{x^3} with respect to x :

351. Differentiate $3^{e} \wedge x$ with respect to x :

352. Differentiate $(\log)_x 3$ with respect to x :

353. Differentiate $3^{x^2 + 2x}$ with respect to x :

354. Differentiate $\sqrt{\dfrac{a^2 - x^2}{a^2 + x^2}}$ with respect to x.

355. Differentiate $3^{x \log x}$ with respect to x :

356. Differentiate $\sqrt{\dfrac{1 + \sin x}{1 - \sin x}}$ with respect to x.

357. Differentiate $\sqrt{\dfrac{1 - x^2}{1 + x^2}}$ with respect to x.

358. Differentiate $(\log \sin x)^2$ with respect to x :

359. Differentiate $\sqrt{\dfrac{1+x}{1-x}}$ with respect to x .

360. Differentiate $\sin\left(\dfrac{1+x^2}{1-x^2}\right)$ with respect to x .

361. Differentiate $e^{3x}\cos 2x$ with respect to x :

362. Differentiate $\sin(\log\sin x)$ with respect to x :

363. Differentiate $e^{\tan 3x}$ with respect to x :

364. Differentiate $e^{\sqrt{\cot x}}$ with respect to x :

365. Differentiate $\log\left(\dfrac{\sin x}{1 + \cos x}\right)$ with respect to x :

366. $\log\sqrt{\dfrac{1 - \cos x}{1 + \cos x}}$

367. Differentiate $e^{\sin x}$ with respect to x :

368. Differentiate $\log\left(x + \sqrt{x^2 + 1}\right)$ with respect to x :

369. Differentiate $\left(e^x \log x\right)$ with respect to x :

370. Differentiate $\log(\cosec x - \cot x)$ with respect to x :

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371. Differentiate $e^{2x}\log x$ with respect to x .

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372. Differentiate $\log\left(\dfrac{x^2 + x + 1}{x^2 - x + 1}\right)$ with respect to x .

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373. Differentiate $\tan^{-1}\left(e^x\right)$ with respect to x :

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374. Differentiate: $e^{\sin^{-1} 2x}$ with respect to x.

375. Differentiate $\sin\left(2 \sin^{-1}x\right)$ with respect to x :

376. Differentiate $e^{\tan^{-1}\sqrt{x}}$ with respect to x.

377. Differentiate $\sqrt{\tan^{-1}\left(\dfrac{x}{2}\right)}$ with respect to x :

378. Differentiate $\log\left(\tan^{-1}x\right)$ with respect to x :

379. Differentiate the following functions $\dfrac{2^x\cos x}{\left(x^2 + 3\right)^2}$ with respect to x

380. Differentiate $x\sin 2x + 5^x + k^k + \left(\tan^2 x\right)^3$ with respect to x :

381. Differentiate $\log(3x + 2) - x^2\log(2x - 1)$ with respect to x :

382. Differentiate $\sin^2\{\log(2x + 3)\}$ with respect to x :

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383. Differentiate $e^x\sin2x$ with respect to x .

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384. Differentiate $\left(\sqrt{x^2 + 1} + \sqrt{x^2 - 1}\right)$ with respect to x .

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385. Differentiate $\log\left\{x + 2 + \sqrt{x^2 + 4x + 1}\right\}$ with respect to x :

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386. Differentiate $\left(\sin^{-1}x^4\right)^4$ with respect to x :

387. Differentiate $\sin\left(\sqrt{x^2+a^2}\right)$ with respect to x :

388. Differentiate $e^x\sin x$ with respect to x .

389. Differentiate $3\,e^{-3x}\log(1+x)$

390. Differentiate the following functions with respect to $\dfrac{x^2 + 2}{\sqrt{\cos x}}$

391. Differentiate $x^2\left(1 - x^2\right)$ with respect to x .

392. Differentiate $\log\left\{\cot\left(\dfrac{\pi}{4} + \dfrac{x}{2}\right)\right\}$ with respect to x :

393. Differentiate the following functions with respect to $e^{ax}\sec x \tan 2x$

394. Differentiate $\log\left(\cos x^2\right)$ with respect to x :

395. Differentiate $\cos(\log x)^2$ with respect to x :

396. Differentiate $\log\sqrt{\dfrac{x-1}{x+1}}$ with respect to x :

397. If $y = \log\left\{\sqrt{x-1} - \sqrt{x+1}\right\}$, show that $\dfrac{dy}{dx} = \dfrac{-1}{2\sqrt{x^2-1}}$

398. If $y = \sqrt{x + 1} + \sqrt{x - 1}$, prove that $\sqrt{x^2 - 1}\dfrac{dy}{dx} = \dfrac{1}{2}y$

399. If $y = \dfrac{x}{x + 2}$, prove that $x\dfrac{dy}{dx} = (1 - y)y$

400. If $y = \log\left(\sqrt{x} + \sqrt{\dfrac{1}{x}}\right)$, prove that $\dfrac{dy}{dx} = \dfrac{x - 1}{2x(x + 1)}$

401. If $y = \log\sqrt{\dfrac{1 - \tan x}{1 + \tan x}}$, prove that $\dfrac{dy}{dx} = -\sec 2x$.

402. If $y = \sqrt{x} + \dfrac{1}{\sqrt{x}}$, prove that $2x\dfrac{dy}{dx} = \sqrt{x} - \dfrac{1}{\sqrt{x}}$

403. If $y = \dfrac{x\sin^{-1}x}{\sqrt{1-x^2}}$, p r o v et h a t $\left(1 - x^2\right)\dfrac{dy}{dx} = x + \dfrac{y}{x}$

404. If $y = \dfrac{e^x - e^{-x}}{e^x + e^{-x}}$, prove that $\dfrac{dy}{dx} = 1 - y^2$

405. If $y = (x - 1)\log(x - 1) - (x + 1)\log(x + 1)$, prove that $\dfrac{dy}{dx} = \log\left(\dfrac{x - 1}{1 + x}\right)$

406. If $y = e^x \cos x$, prove that $\dfrac{dy}{dx} = \sqrt{2}\, e^x \cos\left(x + \dfrac{\pi}{4}\right)$

407. If $y = \dfrac{1}{2} \log\left(\dfrac{1 - \cos 2x}{1 + \cos 2x}\right)$, prove that $\dfrac{dy}{dx} = 2 \operatorname{cosec} 2x$

408. If $y = x \sin^{-1} x + \sqrt{1 - x^2}$, prove that $\dfrac{dy}{dx} = \sin^{-1} x$

409. If $y = \sqrt{x^2 + a^2}$, prove that $y\dfrac{dy}{dx} - x = 0$

410. If $y = e^x + e^{-x}$, prove that $\dfrac{dy}{dx} = \sqrt{y^2 - 4}$

411. If $y = \sqrt{a^2 - x^2}$, prove that $y\dfrac{dy}{dx} + x = 0$

412. If $xy = 4$, prove that $x\left(\dfrac{dy}{dx} + y^2\right) = 3y$

413. Prove that $\dfrac{d}{dx}\left\{\dfrac{x}{2}\sqrt{a^2 - x^2} + \dfrac{a^2}{2}\sin^{-1}\left(\dfrac{x}{a}\right)\right\} = \sqrt{a^2 - x^2}$

414. Differentiate $\sin^{-1}(\sin x)$, $x \in [0,\ 2\pi]$

415. Differentiate $\cos^{-1}(\cos x)$, $x \in [0,\ 2\pi]$

416. Differentiate $\tan^{-1}(\tan x)$, $x \in [0,\ \pi] - \left\{ \dfrac{\pi}{2} \right\}$

417. Differentiate $\sin^{-1}\left(2x\sqrt{1 - x^2} \right)$ with respect to x , if `-1/(sqrt(2))

418. Differentiate $\sin^{-1}\left(2x\sqrt{1 - x^2} \right)$ with respect to x , if `1/(sqrt(2))

419. Differentiate $\sin^{-1}\left(2x\sqrt{1-x^2}\right)$ with respect to x,

420. Differentiate $\sin^{-1}\left(3x - 4x^3\right)$ with respect to x, if `-1/2

421. Differentiate $\sin^{-1}\left(3x - 4x^3\right)$ with respect to x, if `1/2

422. Differentiate $\sin^{-1}\left(3x - 4x^3\right)$ with respect to x

423. Differentiate $\cos^{-1}\left(2x^2 - 1\right)$ with respect to x, if $0 < x < 1$

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424. Differentiate $\cos^{-1}\left(2x^2 - 1\right)$ with respect to x, if -1

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425. Differentiate $\cos^{-1}\left(1 - 2x^2\right)$ with respect to x, if $0 < x < 1$

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426. Differentiate $\cos^{-1}\left(1 - 2x^2\right)$ with respect to x, if `-1

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427. Differentiate $\cos^{-1}\left(4x^3 - 3x\right)$ with respect to x, if $x \in \left(-\dfrac{1}{2}, \dfrac{1}{2}\right)$

428. $y = \sec^{-1}\dfrac{1}{2x^2 - 1}, 0 < x < \dfrac{1}{\sqrt{2}}$

429. Differentiate $\cos^{-1}\left(4x^3 - 3x\right)$ with respect to x, if $x \in \left(-1, \ -\dfrac{1}{2}\right)$

430. Differentiate $\tan^{-1}\left(\dfrac{2x}{1 - x^2}\right)$ with respect to x, if $x \in (-1, \ 1)$

431. Differentiate $\tan^{-1}\left(\dfrac{2x}{1 - x^2}\right)$ with respect to x, if $x \in (-\infty, \ -1)$

432. Differentiate $\tan^{-1}\left(\dfrac{2x}{1 - x^2}\right)$ with respect to x, if $x \in (1, \ \infty)$

433. Differentiate $\tan^{-1}\left(\dfrac{3x - x^3}{1 - 3x^2}\right)$, if `-1/(sqrt(3))

434. Differentiate $\tan^{-1}\left(\dfrac{3x - x^3}{1 - 3x^2}\right)$, if $x > \dfrac{1}{\sqrt{3}}$

435. Differentiate $\tan^{-1}\left(\dfrac{3x - x^3}{1 - 3x^2}\right)$, if $x > \dfrac{1}{\sqrt{3}}$

436. Differentiate $\sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$ with respect to x, when $x \in (-1, \ 1)$

437. Differentiate $\sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$ with respect to x, when $x \in (1, \ \infty)$

438. Differentiate $\sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$ with respect to x, when $x \in (-\infty, \ -1)$

439. Differentiate $\cos^{-1}\left(\dfrac{1 - x^2}{1 + x^2}\right)$ with respect to x, when $x \in (0, \ \infty)$

440. Differentiate $\cos^{-1}\left(\dfrac{1 - x^2}{1 + x^2}\right)$ with respect to x, when $x \in (-\infty, \ 0)$

441. Differentiate $\cos^{-1}\left(\dfrac{1 - x^2}{1 + x^2}\right)$, $0 < x < 1$ with respect to x

442. Differentiate $\sin^{-1}\left(\dfrac{1 - x^2}{1 + x^2}\right)$, $0 < x < 1$ with respect to x

443. Differentiate $\cos^{-1}\left(\dfrac{2x}{1+x^2}\right)$, $-1 < x < 1$ with respect to x

444. Differentiate `sec^(-1)(1/(2x^2-1)),\ 0

445. Differentiate `sin^(-1)(2xsqrt(1-x^2)),\ -1/(sqrt(2))

446. Differentiate $\cos^{-1}\left(2x\sqrt{1-x^2}\right) - \dfrac{1}{\sqrt{2}}$

447. Differentiate `tan^(-1){(1-cosx)/(sinx)},\ -pi

448. Differentiate `tan^(-1){sqrt((1-cosx)/(1+cosx))},\ -pi

449. Differentiate $\tan^{-1}\left\{\sqrt{\dfrac{1 + \cos x}{1 - \cos x}}\right\}$ with respect to x $0 < x < \pi$

450. Differentiate $\tan^{-1}\left\{\dfrac{\cos x}{1 + \sin x}\right\}$, $0 \le x \le \pi$

451. Differentiate `tan^(-1){sqrt((1+sinx)/(1-sinx))},\ -pi/2

452. Differentiate $\tan^{-1}(\sec x + \tan x)$, `-pi/2

453. Differentiate $\tan^{-1}\left\{\sqrt{1 + x^2} + x\right\}$, $x \in \mathbb{R}$ with respect to x .

454. Differentiate the following functions with respect to x : (i)

$\tan^{-1}\left\{\sqrt{1 + x^2} - x\right\}$, $x \in \mathbb{R}$ (ii) $\tan^{-1}\left\{\dfrac{\sqrt{1 + x^2} - 1}{x}\right\}$, $x \neq 0$

455. Differentiate the following functions with respect to x: (i)

$$\tan^{-1}\left\{ \frac{\sqrt{1 + x^2} + 1}{x} \right\}, \quad x \neq 0 \text{ (ii) } \cot^{-1}\left\{ \sqrt{1 + x^2} + x \right\}$$

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456. Differentiate $\tan^{-1}\left\{ \dfrac{\sqrt{1 + \sin x} + \sqrt{1 - \sin x}}{\sqrt{1 + \sin x} - \sqrt{1 - \sin x}} \right\}, 0 < x < \pi$

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457. Differentiate the following functions with respect to x $\tan^{-1}\left(\dfrac{a + x}{1 - ax} \right)$

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458. Differentiate `tan^(-1)((3a^2x-x^3)/(a^3-3a x^2)),\ -1/(sqrt(3))`

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459. Differentiate $\dfrac{\tan^{-1}\sqrt{a-x}}{\sqrt{a+x}}$, $-a < x < a$

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460. If $y = \sin^{-1}\left[x\sqrt{1-x} - \sqrt{x}\sqrt{1-x^2}\right]$ and $0 < x < 1$, then find $\dfrac{dy}{dx}$

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461. differentiate xtany=80

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462. If $y = \tan^{-1}\left\{\dfrac{\sqrt{1+x^2} + \sqrt{1-x^2}}{\sqrt{1+x^2} - \sqrt{1-x^2}}\right\}$, $-1 < x < 1$, $x \neq 0$. Find $\dfrac{dy}{dx}$.

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463. Differentiate $\sin^{-1}\left(\dfrac{2x}{1+x^2}\right) + \cos^{-1}\left(\dfrac{1-x^2}{1+x^2}\right)$, with respect to x , if

$x \in (0, \ 1)$.

464. Differentiate $\sin^{-1}\left(\dfrac{2x}{1+x^2}\right) + \cos^{-1}\left(\dfrac{1-x^2}{1+x^2}\right)$, with respect to x , if

$x \in (1, \ \infty)$

465. Differentiate $\sin^{-1}\left(\dfrac{2x}{1+x^2}\right) + \cos^{-1}\left(\dfrac{1-x^2}{1+x^2}\right)$, with respect to x , if

$x \in (-\infty, \ -1)$

466. Differentiate sinxtanx with respect to x

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467. Differentiate $\tan^{-1}\left(\dfrac{2x}{1-x^2}\right) + \cos^{-1}\left(\dfrac{1-x^2}{1+x^2}\right)$ with respect to x.

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468. Differentiate $\tan^{-1}\left(\dfrac{2x}{1-x^2}\right) + \cos^{-1}\left(\dfrac{1-x^2}{1+x^2}\right)$ with respect to x.

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469. Evaluate $\int\left(x + e^x\right)dx$

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470. If $y = \sin^{-1}x + \sin^{-1}\sqrt{1 - x^2}$, find $\dfrac{dy}{dx}$ in each of the following cases: (i) $x \in (0, \ 1)$ (ii) $x \in (-1, \ 0)$

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471. Differentiate $\cos^{-1}\left\{2x\sqrt{1 - x^2}\right\}$, $\dfrac{1}{\sqrt{2}}$

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472. Differentiate ytanx=tany with respect to x

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473. Differentiate sinxsiny=x with respect to x

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474. Differentiate `sin^(-1){sqrt(1-x^2)},\ 0

475. Differentiate sin2x = sin2y with respect to x

476. Differentiate $\sin^{-1}\left\{\dfrac{x}{\sqrt{x^2 + a^2}}\right\}$ with respect to x

477. Differentiate $\sin(\log x)$ with respect to x

478. Differentiate sinxcosy= logy with respect to x

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479. Differentiate $\cos^{-1}\left\{\dfrac{x}{\sqrt{x^2+a^2}}\right\}$ with respect to x

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480. Differentiate `sin^(-1){(sinx+cosx)/(sqrt(2))},\ -(3pi)/4`

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481. Differentiate `cos^(-1){(cosx+sinx)/(sqrt(2))},\ -pi/4`

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482. Differentiate `tan^(-1){x/(1+sqrt(1-x^2))},\ -1

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483. Differentiate `tan^(-1){x/(a+sqrt(a^2-x^2))},\ -a

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484. Differentiate the following function with respect to x:

$$\sin^{-1}\left\{\frac{x + \sqrt{1 - x^2}}{\sqrt{2}}\right\}, -1 < x < 1$$

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485. Differentiate `cos^(-1){2xsqrt(1-x^2)},\ \ 1/(sqrt(2))

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486. Differentiate `tan^(-1){(4x)/(1-4x^2)},\ -1/2

487. Differentiate $\tan^{-1}\left\{\dfrac{2^{x+1}}{1-4^x}\right\}$, $-\infty < x < 0$ with respect to x

488. Differentiate $\tan^{-1}\left(\dfrac{2a^x}{1-a^{2x}}\right)$, $a > 1$, $-\infty < x < 0$ with respect to x

489. Differentiate `sin^(-1){(sqrt(1+x)+sqrt(1-x))/2},\ \ 0

490. Differentiate the following function with respect to x:

$$\tan^{-1}\left\{\frac{\sqrt{1 + a^2x^2} - 1}{ax}\right\}, x \neq 0$$

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491. Differentiate $\tan^{-1}\left\{\dfrac{\sin x}{1 + \cos x}\right\}$ with respect to x

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492. Differentiate $\sin^{-1}\left(\dfrac{1}{\sqrt{1 + x^2}}\right)$ with respect to x

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

(ii) $\cos^{-1}\left(\dfrac{1 - x^{2n}}{1 + x^{2n}}\right)$

494. Differentiate $\sin^{-1}\left(\dfrac{1 - x^2}{1 + x^2}\right) + \sec^{-1}\left(\dfrac{1 + x^2}{1 - x^2}\right)$, $x \in R$ with respect to x

495. Differentiate $\tan^{-1}\left(\dfrac{a + x}{1 - ax}\right)$ with respect to x

496. Differentiate $\tan^{-1}\left(\dfrac{\sqrt{x} + \sqrt{a}}{1 - \sqrt{xa}}\right)$ with respect to x

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497. Differentiate the following function with respect to x:

$\tan^{-1}\left(\dfrac{a + b\tan x}{b - a\tan x}\right)$

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498. Differentiate $\tan^{-1}\left(\dfrac{a + bx}{b - ax}\right)$ with respect to x .

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499. Differentiate $\tan^{-1}\left(\dfrac{x - a}{x + a}\right)$ with respect to x

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500. Differentiate $\tan^{-1}\left(\dfrac{x}{1 + 6x^2}\right)$ with respect to x

501. Differentiate $\tan^{-1}\left\{\dfrac{5x}{1 - 6x^2}\right\}, -\dfrac{1}{\sqrt{6}} < x < \dfrac{1}{\sqrt{6}}$ with respect to x

502. Differentiate $\tan^{-1}\left\{\dfrac{\cos x + \sin x}{\cos x - \sin x}\right\}$ with respect to x

503. Differentiate $\tan^{-1}\left\{\dfrac{x^{1/3} + a^{1/3}}{1 - (ax)^{1/3}}\right\}$ with respect to x

504. Differentiate $\sin^{-1}\left(\dfrac{2^{x+1}}{1+4^x}\right)$ with respect to x

505. If $y=\sin^{-1}\left(\dfrac{2x}{1+x^2}\right)+\sec^{-1}\left(\dfrac{1+x^2}{1-x^2}\right)$, prove that $\dfrac{dy}{dx}=\dfrac{4}{1+x^2}$.

506. If $y=\sin^{-1}\left(\dfrac{x}{\sqrt{1+x^2}}\right)+\cos^{-1}\left(\dfrac{1}{\sqrt{1+x^2}}\right)$, prove that $\dfrac{dy}{dx}=\dfrac{2x}{1+x^2}$.

507. Differentiate $\cos^{-1}(\sin x)$ with respect to x:

508. Differentiate $\cot^{-1}\left(\dfrac{1-x}{1+x}\right)$ with respect to x.

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509. If $y = \cot^{-1}\left[\dfrac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}}\right], \left(0 < x < \dfrac{\pi}{2}\right)$, then $\dfrac{dy}{dx} =$

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510. If $y = \tan^{-1}\left(\dfrac{2x}{1-x^2}\right) + \sec^{-1}\left(\dfrac{1+x^2}{1-x^2}\right), x > 0$, prove that $\dfrac{dy}{dx} = \dfrac{4}{1+x^2}$.

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511. If $y = \sec^{-1}\left(\dfrac{x+1}{x-1}\right) + \sin^{-1}\left(\dfrac{x-1}{x+1}\right), x > 0$. Find $\dfrac{dy}{dx}$.

512. If $y = \sin\left[2\tan^{-1}\left\{\sqrt{\dfrac{1-x}{1+x}}\right\}\right]$, find $\dfrac{dy}{dx}$

513. If $y = \cos^{-1}(2x) + 2\cos^{-1}\sqrt{1-4x^2}$, x is $\left[0, \dfrac{1}{2}\right]$, find $\dfrac{dy}{dx}$.

514. If the derivative of $\tan^{-1}(a + bx)$ takes the value 1 at $x = 0$, prove that $1 + a^2 = b$.

515. If $y = \cos^{-1}(2x) + 2\cos^{-1}\sqrt{1-4x^2}$, x is $\left[-\dfrac{1}{2}, 0\right]$, find $\dfrac{dy}{dx}$

516. If $y = \tan^{-1}\left\{ \dfrac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}} \right\}$, find $\dfrac{dy}{dx}$

517. If $y = \cos^{-1}\left\{ \dfrac{2x - 3\sqrt{1-x^2}}{\sqrt{13}} \right\}$, find $\dfrac{dy}{dx}$

518. Differentiate the following with respect to x: $\sin^{-1}\left(\dfrac{2^{x+1} \cdot 3^x}{1 + (36)^x} \right)$

519. If $ax^2 + 2\,hxy + by^2 + 2\,gx + 2\,fy + c = 0$, find $\dfrac{dy}{dx}$.

520. If $x^2 + 2xy + y^3 = 42$, find $\dfrac{dy}{dx}$

521. If $x^3 + y^3 = 3axy$, find $\dfrac{dy}{dx}$

522. If $\log\left(x^2 + y^2\right) = 2tan^{-1}\left(\dfrac{y}{x}\right)$, then show that $\dfrac{dy}{dx} = \dfrac{x + y}{x - y}$

523. Find $\dfrac{dy}{dx}$ if $x = \sqrt{1 + y}$

524. If $\cos^{-1}\left(\dfrac{x^2 - y^2}{x^2 + y^2}\right) = \tan^{-1}a$, prove that $\dfrac{dy}{dx} = \dfrac{y^\cdot}{x}$

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525. If $\sin y = x\sin(a + y)$, prove that $\dfrac{dy}{dx} = \dfrac{\sin^2(a + y)}{\sin a}$.

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526. If $\sqrt{1 - x^6} + \sqrt{1 - y^6} = a\left(x^3 - y^3\right)$, provet $\dfrac{dy}{dx} = \dfrac{x^2}{y^2}\sqrt{\dfrac{1 - y^6}{1 - x^6}}$,

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527. If $x^2 + y^2 = t - \dfrac{1}{t}$ and $x^4 + y^4 = t^2 + \dfrac{1}{t^2}$, then prove that $\dfrac{dy}{dx} = \dfrac{1}{x^3 y}$

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528. If $y = b\tan^{-1}\left(\dfrac{x}{a} + \tan^{-1}\dfrac{y}{x}\right)$, find $\dfrac{dy \cdot}{dx}$

529. If $y = \cos^{-1}\sqrt{\dfrac{\cos 3x}{\cos^3 x}}$, then show $\dfrac{dy}{dx} = \sqrt{\dfrac{3}{\cos x \cos 3x}}$

530. If $xy = c^2$, find $\dfrac{dy}{dx}$

531. If $y^3 - 3xy^2 = x^3 + 3x^2 y$, find $\dfrac{dy}{dx}$

532. If $x^{2/3} + y^{2/3} = a^{2/3}$, find $\dfrac{dy}{dx}$

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533. If $4x + 3y = \log(4x - 3y)$, find $\dfrac{dy}{dx}$

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534. If $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$, find $\dfrac{dy}{dx}$

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535. If $x^5 + y^5 = 5\,xy$, find $\dfrac{dy}{dx}$

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536. If $(x + y)^2 = 2axy$, find $\dfrac{dy}{dx}$

537. If $\left(x^2 + y^2\right)^2 = xy$, find $\dfrac{dy}{dx}$

538. $\tan^{-1}\left(x^2 + y^2\right) = a$

539. Find $\dfrac{dy}{dx}$ in each of the following: $e^{x-y} = \log\left(\dfrac{x}{y}\right)$

540. Find $\dfrac{dy}{dx}$ if, $\sin xy + \cos(x + y) = 1$

541. If $\sqrt{1 - x^2} + \sqrt{1 - y^2} = a(x - y)$, prove that $\dfrac{dy}{dx} = \sqrt{\dfrac{1 - y^2}{1 - x^2}}$

542. If $y\sqrt{1 - x^2} + x\sqrt{1 - y^2} = 1$ show that $\dfrac{dy}{dx} = -\sqrt{\dfrac{1 - y^2}{1 - x^2}}$

543. If $xy = 1$, prove that $\dfrac{dy}{dx} + y^2 = 0$.

544. If $xy^2 = 1$, prove that $2\dfrac{dy}{dx} + y^3 = 0$

545. If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, prove that $\dfrac{dy}{dx} = -\dfrac{1}{(x+1)^2}$

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546. If $\log\sqrt{x^2 + y^2} = \tan^{-1}\left(\dfrac{y}{x}\right)$, then $\dfrac{dy}{dx}$ is

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547. If $\sec\left(\dfrac{x+y}{x-y}\right) = a$, prove that $\dfrac{dy}{dx} = \dfrac{y}{x}$.

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548. If $\tan^{-1}\left(\dfrac{x^2 - y^2}{x^2 + y^2}\right) = a$, prove that $\dfrac{dy}{dx} = \dfrac{x(1-\tan a)}{y(1+\tan a)}$.

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549. If $xy \log(x + y) = 1$, prove that $\dfrac{dy}{dx} = -\dfrac{y\left(x^2y + x + y\right)}{x\left(xy^2 + x + y\right)}$.

550. If $y = x\sin(a + y)$, prove that $\dfrac{dy}{dx} = \dfrac{\sin^2(a + y)}{\sin(a + y) - y \cos(a + y)}$.

551. If $x\sin(a + y) + \sin a \cos(a + y) = 0$, prove that $\dfrac{dy}{dx} = \dfrac{s \in^2(a + y)}{\sin a}$

552. If $y = x\sin y$, prove that $\dfrac{dy}{dx} = \dfrac{\sin y}{(1 - x\cos y)}$

553. If $y\sqrt{x^2 + 1} = \log\left(\sqrt{x^2 + 1} - x\right)$, $showthat\left(x^2 + 1\right)\dfrac{dy}{dx} + xy + 1 = 0$

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554. $\sin(xy) + \dfrac{x}{y} = x^2 - y$

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555. If $\tan(x + y) + \tan(x - y) = 1$, find $\dfrac{dy}{dx}$.

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556. If $e^x + e^y = e^{x+y}$, $provethat$ $\dfrac{dy}{dx} = -\dfrac{e^x\left(e^y - 1\right)}{e^y\left(e^x - 1\right)}$ or, $\dfrac{dy}{dx} + e^{y-x} = 0$

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557. If $\cos y = x\cos(a + y)$, with $\cos a \neq \pm 1$, prove that $\dfrac{dy}{dx} = \dfrac{\cos^2(a + y)}{\sin a}$.

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558. If $y = \left\{ (\log)_{\cos x} \sin x \right\} \left\{ (\log)_{\sin x} \cos x \right\}^{-1} + \sin^{-1}\left(\dfrac{2x}{1 + x^2} \right)$, fin d $\dfrac{dy}{dx} atx = \dfrac{\pi}{4}$

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559. If $\sqrt{y + x} + \sqrt{y - x} = c$,show that $\dfrac{dy}{dx} = \dfrac{y}{x} - \sqrt{\dfrac{y^2}{x^2} - 1}.$

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560. Differentiate the following function with respect to $x : x^x$

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561. Differentiate $(\sin x)^{\log x}$ with respect to x :

562. Differentiate $(\cos x)^x$ with respect to x :

563. Differentiate $x^{\sqrt{x}}$ with respect to x :

564. Differentiate $(\log x)^{\sin x}$ with respect to x :

565. $(\sin x)^{\cos x}$

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566. Differentiate $x^{\cos(x)}$ with respect to x :

---

567. Differentiate $(\sin x)^{\cos x}$ with respect to x :

---

568. Differentiate $x^{x^{x}}$ with respect to x :

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569. Differentiate $\left(x^{x}\right)^{x}$ with respect to x :

570. If $y = (\sin x)^{\tan x} + (\cos x)^{\sec x}$, find $\dfrac{dy}{dx}$

571. Differentiate: $(\log x)^x + x^{\log x}$ with respect to x

572. Differentiate $x^{\cot x} + \dfrac{2x^2 - 3}{x^2 + x + 2}$ with respect to x .

573. Differentiate $\cos\left(x^x\right)$ with respect to x :

574. Differentiate $\log\left(x^x + cosec^2 x\right)$ with respect to x :

575. Differentiate $x^x\, e^{2(x+3)}$ with respect to x :

576. If $x^y = e^{x-y}$, prove that $\dfrac{dy}{dx} = \dfrac{\log x}{(1 + \log x)^2}$

577. If $x^y + y^x = 2,$ find $\dfrac{dy}{dx}$.

578. If $x^y = y^x$, find $\dfrac{dy}{dx}$.

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579. If $(\cos x)^y = (\sin y)^x$, find $\dfrac{dy}{dx}$.

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580. If $y = a^x + e^x + x^x + x^a$, find $\dfrac{dy}{dx}$ at $x = a$.

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581. If $y = \dfrac{\sqrt{1 - x^2}(2x - 3)^{1/2}}{\left(x^2 + 2\right)^{2/3}}$, find $\dfrac{dy}{dx}$.

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582. Find the derivative of $\dfrac{\sqrt{x}(x+4)^{\frac{3}{2}}}{(4x-3)^{\frac{4}{3}}}$ with respect to x:

583. If $x^m y^n = (x+y)^{m+n}$, prove that $\dfrac{dy}{dx} = \dfrac{y}{x}$.

584.

If $= \dfrac{ax^2}{(x-a)(x-b)(x-c)} + \dfrac{bx}{(x-b)(x-c)} + \dfrac{c}{x-c} + 1,$ prove that $\dfrac{y'}{y} = \dfrac{1}{x}\left(\dfrac{a}{a-x} + \right.$

585. Prove that the derivative of an even function is an odd function and that of an odd function is an even function.

586. If $y = f\left(\dfrac{2x - 1}{x^2 + 1}\right)$ and $f'(x) = \sin x^2$, find $\dfrac{dy}{dx}$.

587. Given that

$\cos\dfrac{x}{2} \cdot \cos\dfrac{x}{4} \cdot \cos\dfrac{x}{8}\ldots = \dfrac{\sin x}{x}$. Then find the sum $\dfrac{1}{2^2}\sec^2\dfrac{x}{2} + \dfrac{1}{2^4}\sec^2\dfrac{x}{4} + \ldots$

588. Differentiate $x^{1/x}$ with respect to x :

589. Different $x^{\sin x}$ with respect to x :

590. Differentiate $(1 + \cos x)^x$ with respect to x :

591. Differentiate $x\cos^{-1}x$ with respect to x :

592. 5929 students are sitting in an auditorium in such a manner that there are as many students in a row as there are rows in the auditorium. How many rows are there in the auditorium.

593. Differentiate $(\log x)^{\cos x}$ with respect to x :

594. Differentiate $(\sin x)^{\cos x}$ with respect to x :

595. Differentiate $e^x \log x$ with respect to x :

596. Differentiate $(\sin x)^{\log x}$ with respect to x :

597. Differentiate $10^{\log \sin x}$ with respect to x :

598. Differentiate $(\log x)^{\log x}$ with respect to x :

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599. Differentiate $10^{(10x)}$ with respect to x :

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600. Differentiate $\sin\left(x^x\right)$ with respect to x :

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601. Differentiate $\left(\sin^{-1}x\right)^x$ with respect to x :

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602. Differentiate $x^{\sin x}$ with respect to x :

603. Differentiate $(\tan x)^{1/x}$ with respect to x :

604. Differentiate $x^{\tan x}$ with respect to x :

605. Differentiate $\left(x^x\right)\sqrt{x}$ with respect to x :

606. Differentiate $x^{\sin x - \cos x} + \dfrac{x^2 - 1}{x^2 + 1}$ with respect to x .

607. Differentiate $x^{x\cos x} + \dfrac{x^2 + 1}{x^2 - 1}$ with respect to x.

608. Differentiate the following w.r.t. x: $(x\cos x)^x + (x\sin x)^{\frac{1}{x}}$

609. Differentiate $\left(x + \dfrac{1}{x}\right)^x$

610. Differentiate $e^{\sin x} + (\tan x)^x$ with respect to x.

611. Differentiate $(\cos x)^x + (\sin x)^{1/x}$ with respect to x :

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612. Differentiate $x^{x^2-3} + (x-3)^{x^2}$ with respect to x :

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613. Find (dy) if, $y = e^x + 10^x + x^x$

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614. Find $\dfrac{dy}{dx}$ if, $y = x^n + n^x + x^x + n^n$

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615. Find $\dfrac{dy}{dx}$, $y = \dfrac{\left(x^2 - 1\right)^3(2x - 1)}{\sqrt{(x - 3)(4x - 1)}}$

616. Find $\dfrac{dy}{dx}$ if, $y = \dfrac{e^{ax}\sec x \log x}{\sqrt{1 - 2x}}$

617. Find $\dfrac{dy}{dx}$, $y = e^{3x}\sin 4x.\, 2^x$

618. Find $\dfrac{dy}{dx}$ if, $y = \sin x \sin 2x \sin 3x \sin 4x$

619. Find $\dfrac{dy}{dx}$ if, $y = x^{\sin x} + (\sin x)^x$

620. Find $\dfrac{dy}{dx}$, $y = (\sin x)^{\cos x} + (\cos x)^{\sin x}$

621. differentiate $(\tan x)^{\cot x} + (\cot x)^{\tan x}$

622. If $y = (\sin x)^x + \sin^{-1}\sqrt{x}$ then find $\dfrac{dy}{dx}$.

623. If $y = x^{\cos x} + (\sin x)^{\tan x}$, find $\dfrac{dy}{dx}$

624. If $y = x^x + (\sin x)^x$, find $\dfrac{dy}{dx}$

625. If $y = (\tan x)^{\log x} + \cos^2\left(\dfrac{\pi}{4}\right)$, find $\dfrac{dy}{dx}$

626. If $y = x^x + x^{1/x}$, find $\dfrac{dy}{dx}$

627. If $y = x^{\log x} + (\log x)^x$ then find $\dfrac{dy}{dx}$

628. If $x^{13}y^7 = (x + y)^{20}$, prove that $\dfrac{dy}{dx} = \dfrac{y}{x}$

629. If $x^{16}y^9 = \left(x^2 + y\right)^{17}$, prove that $x\dfrac{dy}{dx} = 2y$

630. If $y = \sin\left(x^x\right)$, prove that $\dfrac{dy}{dx} = \cos\left(x^x\right).\, x^x(1 + \log x)$

631. If $x^x + y^x = 1$, prove that $\dfrac{dy}{dx} = -\left\{\dfrac{x^x(1 + \log x) + y^x.\log y}{x.\, y^{(x-1)}}\right\}$

632. If $x^y \cdot y^x = 1$, prove that $\dfrac{dy}{dx} = -\dfrac{y(y + x\log y)}{x(y\log x + x)}$

633. If $y^x + x^y = (x + y)^{x+y}$ find $\dfrac{dy}{dx}$

634. If $x^m \, y^n = 1$, prove that $\dfrac{dy}{dx} = -\dfrac{my}{nx}$

635. If $y^x = e^{y-x}$, prove that $\dfrac{dy}{dx} = \dfrac{(1 + \log y)^2}{\log y}$

636. If $(\sin x)^y = (\cos y)^x$, prove that $\dfrac{dy}{dx} = \dfrac{\log \cos y - y \cot x}{\log \sin x + x \tan y}$

637. If $(\cos x)^y = (\tan y)^x$, prove that $\dfrac{dy}{dx} = \dfrac{\log \tan y + y \tan x}{\log \cos x - x \sec y \cosec y}$

638. If $e^x + e^y = e^{x+y}$, prove that $\dfrac{dy}{dx} + e^{y-x} = 0$

639. If $e^y = y^x$, prove that $\dfrac{dy}{dx} = \dfrac{(\log y)^2}{\log y - 1}$

640. If $e^{x+y} - x = 0$, prove that $\dfrac{dy}{dx} = \dfrac{1-x}{x}$

641. If $y = x\sin(a + y)$, prove that $\dfrac{dy}{dx} = \dfrac{s\in^2(a+y)}{\sin(a+y) - y\cos(a+y)}$

642. If $x\sin(a + y) + \sin a\cos(a + y) = 0$, prove that $\dfrac{dy}{dx} = \dfrac{s\in^2(a+y)}{\sin a}$

643. If $(\sin x)^y = x + y$, prove that $\dfrac{dy}{dx} = \dfrac{1 - (x+y)y\cot x}{(x+y)\log\sin x - 1}$

644. If $(x - y)\, e^{\frac{x}{x-y}} = a$, prove that $y\dfrac{dy}{dx} + x = 2y$.

645. If $y = x\sin y$, prove that $\dfrac{dy}{dx} = \dfrac{y}{x(1 - x\cos y)}$

646. Find the derivative of the function $f(x)$ given by $f(x) = (1 + x)\left(1 + x^2\right)\left(1 + x^4\right)\left(1 + x^8\right)$ and hence find $f'(1)$

647. If $y = \log\left(\dfrac{x^2 + x + 1}{x^2 - x + 1}\right) + \dfrac{2}{\sqrt{3}}\tan^{-1}\left(\dfrac{\sqrt{3}x}{1 - x^2}\right)$, find $\dfrac{dy}{dx}$

648. If $y = (\sin x - \cos x)^{\sin x - \cos x}, \dfrac{\pi}{4} < x < \dfrac{3\pi}{4}$ find dy/dx

649. If $xy = e^{x-y}$, find $\dfrac{dy}{dx}$.

650. If $y^x + x^y + x^x = a^b$, find $\dfrac{dy}{dx}$.

651. If $(\cos x)^y = (\cos y)^x$ find $\dfrac{dy}{dx}$.

652. If $\cos y = x\cos(a + y)$, where $\cos a \neq -1$, prove that $\dfrac{dy}{dx} = \dfrac{\cos^2(a + y)}{\sin a}$

653. If $(x - y)\, e^{\frac{x}{x-y}} = a$, prove that $y\dfrac{dy}{dx} + x = 2y$.

654. If $x = e^{x/y}$, then prove that $\dfrac{dy}{dx} = \dfrac{x - y}{x\log x}$.

655. If $y = x^{\tan x} + \sqrt{\dfrac{x^2 + 1}{2}}$, find $\dfrac{dy}{dx}$

656. If $y = 1 + \dfrac{\alpha}{\left(\frac{1}{x} - \alpha\right)} + \dfrac{\beta/x}{\left(\frac{1}{x} - \alpha\right)\left(\frac{1}{x} - \beta\right)} + \dfrac{\gamma/x^2}{\left(\frac{1}{x} - \alpha\right)\left(\frac{1}{x} - \beta\right)\left(\frac{1}{x} - \gamma\right)}$, find

$\dfrac{dy}{dx}$

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657. If $y = x^x$, find $\dfrac{dy}{dx}$.

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658. If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \overset{.}{}}}} \to \infty$, prove that $\dfrac{dy}{dx} = \dfrac{\cos x}{2y - 1}$

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659. If $y = a^{x^{a^{x \ldots \infty}}}$, prove that $\dfrac{dy}{dx} = \dfrac{y^2(\log y)}{x[1 - y(\log x)(\log y)]}$

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660. If $y = e^{x + e^{x + e^{x + \cdots \infty}}}$, show that $\dfrac{dy}{dx} = \dfrac{y}{1 - y}$.

661. If $y = \sqrt{x^{\sqrt{x}^{\sqrt{x}^{\cdots \infty}}}}$, show that $\dfrac{dy}{dx} = \dfrac{y^2}{x(2 - y\log x)}$.

662. If $y = x + \dfrac{1}{x + \dfrac{1}{x + \dfrac{1}{x + \cdots}}}$, prove that $\dfrac{dy}{dx} = \dfrac{y}{2y - x}$.

663. If $y = \dfrac{\sin x}{1 + \dfrac{\cos x}{1 + \dfrac{\sin x}{1 + \dfrac{\cos x}{1 + \cdots \infty}}}}$, prove that $\dfrac{dy}{dx} = \dfrac{(1 + y)\cos x + y \sin x}{1 + 2y + \cos x - \sin x}$.

664. If $y = \sqrt{x + \sqrt{x + \sqrt{x + \cdots}}} \to \infty$, prove that $\dfrac{dy}{dx} = \dfrac{1}{2y - 1}$

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665. If $y = \sqrt{\cos x + \sqrt{\cos x + \sqrt{\cos x + \cdots}}} \to \infty$, prove that $\dfrac{dy}{dx} = \dfrac{\sin x}{1 - 2y}$.

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666. If $y = \sqrt{\log x + \sqrt{\log x + \sqrt{\log x + \cdots}}} \to \infty$, prove that $(2y - 1)\dfrac{dy}{dx} = \dfrac{1}{x}$.

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667. If $y = \sqrt{\tan x + \sqrt{\tan x + \sqrt{\tan x + \cdots}}} \to \infty$, prove that $\dfrac{dy}{dx} = \dfrac{\sec^2 x}{2y - 1}$

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668. If $y = \sin x^{\sin x^{\sin x^{\cdot^{\cdot^{\infty}}}}}$, prove that $\dfrac{dy}{dx} = \dfrac{y^2 \cot x}{(1 - y\log\sin x)}$

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669. Prove that : $\cos 6x = 32\cos^6 x - 48\cos^4 x - 18\cos^2 x - 1$

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670. If $y = e^{x^{e^x}} + x^{e^{e^x}} + e^{x^{x^e}}$, prove that

$\dfrac{dy}{dx} = e^{x^{e^x}} \cdot x^{e^x}\left\{ \dfrac{e^x}{x} + e^x.\log x \right\} + x^{e^{e^x}} \cdot e^{e^x}\left\{ \dfrac{1}{x} + e^x \log x \right\} + e^{x^{x^e}} \cdot x^{x^e} \cdot x^{e-1}\{1 + e\log x\}$

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671. If $y = \cos x^{\cos x^{\cos x^{\cdot^{\cdot^{\infty}}}}}$, prove that $\dfrac{dy}{dx} = -\dfrac{y^2 \tan x}{(1 - y\log\cos x)}$

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672. Find $\dfrac{dy}{dx}$: $x = a\left\{ \cos t + \dfrac{1}{2}\log\tan^2\dfrac{t}{2} \right\}$ and $y = a\sin t$.

673. Find $\dfrac{dy}{dx}$, when $x = a(\theta + \sin\theta) and y = a(1 - \cos\theta)$

674. If $x = a\sec^3\theta and y = a\tan^3\theta, f \in d\dfrac{dy}{dx}a h\eta = \dfrac{\pi}{3}$

675. Find $\dfrac{dy}{dx}$, when $x = a\cos^3 t$ and $y = at$.

676. If $x = \sqrt{a^{\sin^{-1}t}}, y = \sqrt{a^{\cos^{-1}t}}$, show that $\dfrac{dy}{dx} = -\dfrac{y}{x}$

677. If $x = \sin^{-1}\left(\dfrac{2t}{1+t^2}\right)$ and y=$\tan^{-1}\left(\dfrac{2t}{1-t^2}\right)$, $t > 1$. Prove that dy/dx=-1

678. If $u = \sin\left(m\cos^{-1}x\right), v = \cos\left(m\sin^{-1}x\right), provethat\dfrac{du}{dv} = \sqrt{\dfrac{1-u^2}{1-v^2}}$

679. If $x = \sec\theta - \cos\theta$ and $y = \sec^n\theta - \cos^n\theta$ then show that

$$\left(x^2 + 4\right)\left(\dfrac{dy}{dx}\right)^2 = n^2\left(y^2 + 4\right)$$

680. Find $\dfrac{dy}{dx}$, when $x = at^2$ and $y = 2\,at$

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681. Find $\dfrac{dy}{dx}$, when $x = a(\theta + \sin\theta) and y = a(1 - \cos\theta)$

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682. Find $\dfrac{dy}{dx}$ when

$x = a\cos\theta$ and $y = b\sin\theta$

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683. Find $\dfrac{dy}{dx}$, when $x = ae^{\theta}(\sin\theta - \cos\theta), y = ae^{\theta}(\sin\theta + \cos\theta)$

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684. Find $\dfrac{dy}{dx}$, when $x = b\sin^2\theta$ and $y = a\cos^2\theta$

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685. Find $\dfrac{dy}{dx}$, when $x = a(\theta + \sin\theta) and y = a(1 - \cos\theta)$

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686. Find $\dfrac{dy}{dx}$, when $x = \dfrac{e^t + e^{-t}}{2}$ and $y = \dfrac{e^t - e^{-t}}{2}$

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687. Find $\dfrac{dy}{dx}$, when $x = \dfrac{3at}{1 + t^2}$ and $y = \dfrac{3at^2}{1 + t^2}$

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688. If x and y are connected parametrically by the equations given, without eliminating the parameter, Find $\dfrac{dy}{dx}$.

$x = a(\cos\theta + \theta\sin\theta), y = a(\sin\theta - \theta\cos\theta)$

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689. $x = e^{\theta}\left(\theta + \dfrac{1}{\theta}\right), y = e^{-\theta}\left(\theta - \dfrac{1}{\theta}\right)$

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690. Find $\dfrac{dy}{dx}$, when $x = \dfrac{2t}{1 + t^2}$ and $y = \dfrac{1 - t^2}{1 + t^2}$

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691. Find $\dfrac{dy}{dx}$, when $x = \dfrac{\cos^{-1}1}{\sqrt{1 + t^2}}$ and $y = \dfrac{\sin^{-1}1}{\sqrt{1 + t^2}}$, tR

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692. Find $\dfrac{dy}{dx}$, when $x = \dfrac{1 - t^2}{1 + t^2}$ and $y = \dfrac{2t}{1 + t^2}$

693. If $x = 2\cos\theta - \cos2\theta$ and $y = 2\sin\theta - \sin2\theta$ Prove that $\dfrac{dy}{dx} = \tan\left(\dfrac{3\theta}{2}\right)$·

694. If $x = e^{\cos2t}$ and $y = e^{\sin2t}$, then move that $\dfrac{dy}{dx} = -\dfrac{y\log x}{x\log y}$·

695. If $x = \cos t$ and $y = \sin t$, prove : $\dfrac{dy}{dx} = \dfrac{1}{\sqrt{3}}$ at $t = \dfrac{2\pi}{3}$

696. $x = t + \dfrac{1}{t}, y = t - \dfrac{1}{t}$

697. If `x=sin^(-1)((2t)/(1+t^2))"and"y=tan^(-1)((2t)/(1-t^2)),-1

698. If x and y are connected parametrically by the equations given, without eliminating the parameter, Find $\dfrac{dy}{dx} . x = \dfrac{\sin^3 t}{\sqrt{\cos 2t}}, y = \dfrac{\cos^3 t}{\sqrt{\cos 2t}}$

699. If $a > 0, x = \left(t + \dfrac{1}{t}\right)^a, y = a^{t + \frac{1}{t}}$, find $\dfrac{dy}{dx}$

700. If $x = a\left(\dfrac{1 + t^2}{1 - t^2}\right)$ and $y = \dfrac{2t}{1 - t^2}$, f i n d $\dfrac{dy}{dx}$

701. If $x = 10(t - \sin t)$, $y = 12(1 - \cos t)$, find $\dfrac{dy}{dx}$.

702. If $x = a(\theta - \sin\theta)$ and, $y = a(1 + \cos\theta)$, find $\dfrac{dy}{dx}$ at $\theta = \dfrac{\pi}{3}$.

703. If $x = a\sin 2t(1 + \cos 2t)$ and $y = b\cos 2t(1 - \cos 2t)$, show that at $\dfrac{\pi}{4}, \dfrac{dy}{dx} = \dfrac{b}{a}$.

704. If $x = \cos t\left(3 - 2\cos^2 t\right)$ and $y = \sin t\left(3 - 2\sin^2 t\right)$ find the value of $\dfrac{dy}{dx}$ at $t = \dfrac{\pi}{4}$

705. If $x = \dfrac{1 + \log t}{t^2}, y = \dfrac{3 + 2\log t}{t}$, f i n d $\dfrac{dy}{dx}$.

706. If $x = 3\sin t - \sin 3t, y = 3\cos t - \cos 3t$, f i n d $\dfrac{dy}{dx}$ a t $t = \dfrac{\pi}{3}$.

707. If $\sin x = \dfrac{2t}{1 + t^2}$, $\tan y = \dfrac{2t}{1 - t^2}$, find $\dfrac{dy}{dx}$.

708. Differentiate $\log \sin x$ with respect to $\sqrt{\cos x}$.

709. Differentiate $\tan^{-1}\left(\dfrac{1 + 2x}{1 - 2x}\right) with respeco \sqrt{1 + 4x^2}$

710. Differentiate $\tan^{-1}\left(\dfrac{\sqrt{1 + x^2} - 1}{x}\right)$ with respect to $\tan^{-1}x,\ x \neq 0$.

711. Differentiate $\sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$ with respect to $\tan^{-1}x\ ` $.

712. Differentiate x^x with respect to $x \log x$.

713. Differentiate $\tan^{-1} \left\{ \dfrac{\sqrt{1 + x^2} - \sqrt{1 - x^2}}{\sqrt{1 + x^2} + \sqrt{1 - x^2}} \right\}$ with respect to $\cos^{-1} x^2$

714. Differentiate $x^{\sin^{-1} x}$ with respect to $\sin^{-1} x$.

715. If $x \in \left(\dfrac{1}{\sqrt{2}}, 1 \right)$, differentiate $\tan^{-1} \left(\dfrac{\sqrt{1 - x^2}}{x} \right)$ with respect to $\cos^{-1} \left(2x \sqrt{1 - x^2} \right)$.

716. Differentiate $\tan^{-1}\left(\dfrac{2x}{1-x^2}\right)$ with respect to x

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717. Differentiate $\tan^{-1}\left(\dfrac{2x}{1-x^2}\right)$ with respect to x

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

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719. If $-\dfrac{1}{\sqrt{3}} < x < \dfrac{1}{\sqrt{3}}$, differentiate $\tan^{-1}\left(\dfrac{3x - x^3}{1 - 3x^2}\right)$ with respect to $\tan^{-1}\left(\dfrac{2x}{1 - x^2}\right)$.

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720. Differentiate x^2 with respect to x^3 .

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721. Differentiate $\log\left(1 + x^2\right)$ with respect to $\tan^{-1}x$.

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722. Differentiate $(\log x)^x$ with respect to $\log x$.

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723. Differentiate $\sin^{-1}\sqrt{1 - x^2}$ with respect to x

724. Find $\dfrac{dy}{dx}$ if $y = (x - 1)^{\frac{1}{2}}$

725. Differentiate $\sin^{-1}\sqrt{1 - x^2}$ with respect to $\cos^{-1}x$,

726. Differentiate $\tan^{-1}\left(\dfrac{\sqrt{1 + x^2} - 1}{x}\right)$ with respect to $\sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$,

727. Find $\dfrac{dy}{dx}$ **if** $y - x - x^6 = 0$

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728. Differentiate $\sin^{-1}\left(2x\sqrt{1 - x^2}\right)$ **with respect to `x'**

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729. Differentiate $(\cos x)^{\sin x}$ **with respect to** $(\sin x)^{\cos x}$.

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730. Differentiate $\cos^{-1}\left(\dfrac{1 - x^2}{1 + x^2}\right)$.

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731. Differentiate $\tan^{-1}\left(\dfrac{1 + ax}{1 - ax}\right)$ with respect to $\sqrt{1 + a^2x^2}$.

732. Differentiate $\sin^{-1}\left(2x\sqrt{1 - x^2}\right)$ with respect to $\tan^{-1}\left(\dfrac{x}{\sqrt{1 - x^2}}\right)$.

733. Differentiate $\tan^{-1}\left(\dfrac{2x}{1 - x^2}\right)$ with respect to $\cos^{-1}\left(\dfrac{1 - x^2}{1 + x^2}\right)$

734. Differentiate $\tan^{-1}\left(\dfrac{x - 1}{x + 1}\right)$ with respect to $\sin^{-1}\left(3x - 4x^3\right)$, if -1/2

735. Find $\dfrac{dy}{dx}$ **if** $y = \dfrac{\cos x}{1 + \sin x}$

736. Differentiate $\sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$ **with respect to** $\tan^{-1}\left(\dfrac{2x}{1 - x^2}\right)$,

737. Differentiate $\cos^{-1}\left(4x^3 - 3x\right)$ **with respect to** `x' .

738. Differentiate $\sin^{-1}\left(2x\sqrt{1 - x^2}\right)$,

739. Differentiate $\sin^{-1}\sqrt{1 - x^2}$ with respect to $\cos^{-1}x$, if $x \in [-1, 0]$

740. Differentiate $\sin^{-1}\left(2ax\sqrt{1 - a^2x^2}\right)$ with respect to $\sqrt{1 - a^2x^2}$, if $-\dfrac{1}{\sqrt{2}} < ax < \dfrac{1}{\sqrt{2}}$.

741. Differentiate $\tan^{-1}\left(\dfrac{1 - x}{1 + x}\right)$ with respect to $\sqrt{1 - x^2}$, if $-1 < x < 1$.

742. If $f(x) = \begin{vmatrix} x + a^2 & ab & ac \\ ab & x + b^2 & bc \\ ac & bc & x + c^2 \end{vmatrix}$. then $f'(x)$

743. If $f_r(x), g_r(x), h_r(x), r = 1, 2, 3$ are polynomials such that

$f_r(a) = g_r(a) = h_r(a), r = 1, 2, 3 and$ $F(x) = \begin{vmatrix} f_1(x) & f_2(x) & f_3(x) \\ g_1(x) & g_2(x) & g_3(x) \\ h_1(x) & h_2(x) & h_3(x) \end{vmatrix}$ then

$F'(x) at x = a$ is_____

744. If $f(x), g(x) and h(x)$ are three polynomials of degree 2, then prove that

$\varphi(x) = \begin{vmatrix} f(x)g(x)h(x)f'(x)g'(x)h'(x)f^x g^x h^x \end{vmatrix} isaconstantpolynomial$

745. If $f, g,$ and h are differentiable functions of x and

$delta = \begin{vmatrix} f & g & h \\ (xf)' & (xg)' & (xh)' \\ \left(x^2 f\right)'' & \left(x^2 g\right)'' & \left(x^2 h\right)'' \end{vmatrix}$ prove that

$$\text{delta}' = \begin{vmatrix} f & g & f \\ f' & g' & h' \\ \left(x^3f'\right)' & \left(x^3g''\right)' & \left(x^3h''\right)' \end{vmatrix}$$

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746. If $y = |f(x)g(x)h(x)lmnabc|$, prove that $\dfrac{dy}{dx} = \left| f'(x)g'(x)h'(x)lmnabc \right|$.

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747. If $f(x) = (\log)_e\left((\log)_e x\right)$, then write the value of $f'(e)$.

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748. If $f(x) = x + 1$, then write the value of $\dfrac{d}{dx}(fof)(x)$.

749. If $f'(1) = 2$ and $y = f\left((\log)_e x\right)$, find $\dfrac{dy}{dx}$ at $x = e$.

750. If $f(1) = 4$, $f'(1) = 2$, find the value of the derivative of $\log\left(f\left(e^x\right)\right)$ with respect to x at the point $x = 0$.

751. If $f'(x) = \sqrt{2x^2 - 1}$ and $y = f\left(x^2\right)$, then find $\dfrac{dy}{dx}$ at $x = 1$.

752. Let $g(x)$ be the inverse of an invertible function $f(x)$ which is derivable at $x = 3$. If $f(3) = 9$ and $f'(3) = 9$, write the value of $g'(9)$.

753. If $y = \sin^{-1}(\sin x)$, $-\dfrac{\pi}{2} \le x \le \dfrac{\pi}{2}$. Then, write the value of $\dfrac{dy}{dx}$ for $x \in \left(-\dfrac{\pi}{2}, \dfrac{\pi}{2} \right)$.

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754. Find $\dfrac{dy}{dx}$ if $x = \sin 2y$

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755. If $\pi \le x \le 2\pi$ and $y = \cos^{-1}(\cos x)$, find $\dfrac{dy}{dx}$.

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756. Find $\dfrac{dy}{dx}$ if $x = \sin^2 y$

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757. If $f(0) = f(1) = 0$, $f'(1) = f'(0) = 2$ and $y = f\left(e^x\right)e^{f(x)}$, write the value of $\dfrac{dy}{dx}$ at $x = 0$.

758. If $y = x|x|$, find $\dfrac{dy}{dx}$ for $x < 0$.

759. If $y = \sin^{-1}x + \cos^{-1}x$, find $\dfrac{dy}{dx}$.

760. If $x = a(\theta + \sin\theta)$, $y = a(1 + \cos\theta)$, find $\dfrac{dy}{dx}$.

761. If $y = x^x$, find $\dfrac{dy}{dx}$ at $x = e$.

762. If $y = \tan^{-1}\left(\dfrac{1 - x}{1 + x}\right)$, find $\dfrac{dy}{dx}$.

763. If $y = (\log)_a x$, find $\dfrac{dy}{dx}$.

764. If $y = \log\sqrt{\tan x}$, write $\dfrac{dy}{dx}$.

765. If $y = \sin^{-1}\left(\dfrac{1 - x^2}{1 + x^2}\right) + \cos^{-1}\left(\dfrac{1 - x^2}{1 + x^2}\right)$, find $\dfrac{dy}{dx}$.

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766. If $y = \sec^{-1}\left(\dfrac{x + 1}{x - 1}\right) + \sin^{-1}\left(\dfrac{x - 1}{x + 1}\right)$, $x > 0$. Find $\dfrac{dy}{dx}$.

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767. If $|x| < 1$ and $y = 1 + x + x^2 + \overset{..}{} \rightarrow \infty$, then find the value of $\dfrac{dy}{dx}$.

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768. If $u = \sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$ and $v = \tan^{-1}\left(\dfrac{2x}{1 - x^2}\right)$, where `-1

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769. If $f(x) = \log\left\{\dfrac{u(x)}{v(x)}\right\}$, $u(1) = v(1)$ and $u'(1) = v'(1) = 2$, then find the value of $f'(1)$.

770. If $y = \log(3x)$, $x \neq 0$, find $\dfrac{dy}{dx}$.

771. If $f(x)$ is an even function, then write whether $f'(x)$ is even or odd.

772. If $f(x)$ is an odd function, then write whether $f'(x)$ is even or odd.

773. Write the derivative of $\sin x$ w.r.t. $\cos x$

774. If $f(x) = (\log)_{x^2}(\log x)$, then $f'(x)$ at $x = e$ is (a) 0 (b) 1 (c) 1/e (d) 1/2e

775. The differential coefficient of $f(\log x)$ with respect to x, where $f(x) = \log x$ is (a)$\dfrac{x}{\log x}$ (b) $\dfrac{\log x}{x}$ (c) $(x\log x)^{-1}$ (d) none of these

776. The derivative of the function $\cot^{-1}\left\{(\cos 2x)^{1/2}\right\}$ at $x = \pi/6$ is (a) $(2/3)^{1/2}$ (b) $(1/3)^{1/2}$ (c) $3^{1/2}$ (d) $6^{1/2}$

777. Differential coefficient of $\sec\left(\tan^{-1}x\right)$ is (a) $\dfrac{x}{1 + x^2}$ (b) $x\sqrt{1 + x^2}$ (c) $\dfrac{1}{\sqrt{1 + x^2}}$ (d) $\dfrac{x}{\sqrt{1 + x^2}}$

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778. If $y = \tan^{-1}\sqrt{\dfrac{1 - \sin x}{1 + \sin x}}$, then the value of $\dfrac{dy}{dx}$ at $x = \dfrac{\pi}{6}$ is.

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779. If $y = \left(1 + \dfrac{1}{x}\right)^x$, then $\dfrac{dy}{dx} = $ (a) $\left(1 + \dfrac{1}{x}\right)^x\left\{\log\left(1 + \dfrac{1}{x}\right) - \dfrac{1}{x + 1}\right\}$ (b)

$\left(1 + \dfrac{1}{x}\right)^x\log\left(1 + \dfrac{1}{x}\right)$ (c) $\left(x + \dfrac{1}{x}\right)^x\left\{\log(x + 1) - \dfrac{x}{x + 1}\right\}$ (d)

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

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780. If $x^y = e^{x-y}$, then $\dfrac{dy}{dx}$ is (a)$\dfrac{1+x}{1+\log x}$ (b) $\dfrac{1-\log x}{1+\log x}$ (c) not defined (d)

$\dfrac{\log x}{(1+\log x)^2}$

781. Given $f(x) = 4x^8$, then (a)$f'\left(\dfrac{1}{2}\right) = f'\left(-\dfrac{1}{2}\right)$ (b) $f\left(\dfrac{1}{2}\right) = -f'\left(-\dfrac{1}{2}\right)$ (c)

$f\left(-\dfrac{1}{2}\right) = -f'\left(\dfrac{1}{2}\right)$ (d) $f\left(\dfrac{1}{2}\right) = f'\left(-\dfrac{1}{2}\right)$

782. If $x = a\cos^3\theta, \ y = a\sin^3\theta$, then $\sqrt{1 + \left(\dfrac{dy}{dx}\right)^2} = $ (a)$\tan^2\theta$ (b) $\sec^2\theta$ (c)

$\sec\theta$ (d) $|\sec\theta|$

783. If $y = \sin^{-1}\left(\dfrac{1 - x^2}{1 + x^2}\right)$, then $\dfrac{dy}{dx} =$ (a)- $\dfrac{2}{1 + x^2}$ (b) $\dfrac{2}{1 + x^2}$ (c) $\dfrac{1}{2 - x^2}$ (d)

$\dfrac{2}{2 - x^2}$

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784. The derivative of $\sec^{-1}\left(\dfrac{1}{2x^2 - 1}\right)$ with respect to $\sqrt{1 + 3x}$ at $x = -\dfrac{1}{3}$

(a) does not exist (b) 0 (c) 1/2 (d) 1/3

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785. For the curve $\sqrt{x} + \sqrt{y} = 1$, $\dfrac{dy}{dx}$ at $(1/4, \ 1/4)$ is

(a)1/2

(b) 1

(c) -1

(d) 2

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786. If $\sin(x + y) = \log(x + y)$, then $\dfrac{dy}{dx} =$

(a) 2

(b) -2

(c) 1

(d) - 1

787. Let $U = \sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$ and $V = \tan^{-1}\left(\dfrac{2x}{1 - x^2}\right)$, then $\dfrac{dU}{dV} =$

(a)1/2

(b) x

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

(d) 1

788. $\dfrac{d}{dx}\left\{\tan^{-1}\left(\dfrac{\cos x}{1+\sin x}\right)\right\}$ equals

(a)1/2

(b) –1/2

(c) 1

(d) -1

789. $\dfrac{d}{dx}\left[\log\left\{e^x\left(\dfrac{x-2}{x+2}\right)^{3/4}\right\}\right]$ equals

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

(b) 1

(c) $\dfrac{x^2+1}{x^2-4}$

(d) $e^x\dfrac{x^2-1}{x^2-4}$

790. If $y = \sqrt{\sin x + y}$, then $\dfrac{dy}{dx} =$

(a) $\dfrac{\sin x}{2y - 1}$

(b) $\dfrac{\sin x}{1 - 2y}$

(c) $\dfrac{\cos x}{1 - 2y}$

(d) $\dfrac{\cos x}{2y - 1}$

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791. If $3\sin(xy) + 4\cos(xy) = 5$, then $\dfrac{dy}{dx} =$

(a) $\dfrac{y}{x}$

(b) $\dfrac{3\sin(xy) + 4\cos(xy)}{3\cos(xy) - 4\sin(xy)}$

(c) $\dfrac{3\cos(xy) + 4\sin(xy)}{4\cos(xy) - 3\sin(xy)}$

(d) none

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792. If $\sin y = x\sin(a + y)$, then $\dfrac{dy}{dx}$ is

(a) $\dfrac{\sin a}{\sin a \sin^2(a + y)}$

(b) $\dfrac{\sin^2(a + y)}{\sin a}$

(c) $\sin a \sin^2(a + y)$

(d) $\dfrac{\sin^2(a - y)}{\sin a}$

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793. The derivative of $\cos^{-1}\left(2x^2 - 1\right)$ with respect to $\cos^{-1}x$ is

(a) 2 (b) $\dfrac{1}{2\sqrt{1 - x^2}}$ (c) $2/x$ (d) $1 - x^2$

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794. If $f(x) = \sqrt{x^2 + 6x + 9}$, then $f'(x)$ is equal to (a) 1 for $x < -3$ (b) -1 for

$x < -3$ (c) 1 for all $x \in \mathbb{R}$ (d) none of these

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795. If $f(x) = \left| x^2 - 9x + 20 \right|$, then $f'(x)$ is equal to (a) $-2x + 9$ for all $x \in \mathbb{R}$

(b) $2x - 9$ if $4 < x < 5$ (c) $-2x + 9$ if $4 < x < 5$ (d) None of these

796. If $f(x) = \sqrt{x^2 - 10x + 25}$, then the derivative of $f(x)$ in the interval $[0, 7]$

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

797. If $f(x) = |x - 3|$ and $g(x) = fof(x)$, then for $x > 10$, $g'(x)$ is equal to (a) 1

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

798. If $f(x) = \left(\dfrac{x^l}{x^m}\right)^{l+m} \left(\dfrac{x^m}{x^n}\right)^{m+n} \left(\dfrac{x^n}{x^l}\right)^{n+l}$, then $f'(x)$ is equal to

(a) 1 (b) 0 (c) x^{l+m+n} (d) none of these

799. If $y = \dfrac{1}{1 + x^{a-b} + x^{c-b}} + \dfrac{1}{1 + x^{b-c} + x^{a-c}} + \dfrac{1}{1 + x^{b-a} + x^{c-a}}$, then

(dy)/(dx) is equal to (a)1 (b) $(a + b + c)^{x+b+c-1}$ 0 (d) none of these

800. If $\sqrt{1 - x^6}$ then find dy/dx

801. If $y = \log\sqrt{\tan x}$, then the value of $\dfrac{dy}{dx}$ at $x = \dfrac{\pi}{4}$ is given by (a)∞ (b) 1 (c) 0 (d) $\dfrac{1}{2}$

802. If $\sin^{-1}\left(\dfrac{x^2 - y^2}{x^2 + y^2}\right) = \log a$ then $\dfrac{dy}{dx}$ is equal to

(a) $\dfrac{x^2 - y^2}{x^2 + y^2}$ (b) $\dfrac{y}{x}$ (c) $\dfrac{x}{y}$ (d) none of these

803. If $\sin y = x\cos(a + y)$, then $\dfrac{dy}{dx}$ is equal to

(a) $\dfrac{\cos^2(a + y)}{\cos a}$ (b) $\dfrac{\cos a}{\cos^2(a + y)}$ (c) $\dfrac{\sin^2 y}{\cos a}$ (d) none of these

804. If $y = \log\left(\dfrac{1 - x^2}{1 + x^2}\right)$, then $\dfrac{dy}{dx} =$ (a) $\dfrac{4x^3}{1 - x^4}$ (b) $-\dfrac{4x}{1 - x^4}$ (c) $\dfrac{1}{4 - x^4}$ (d) $-\dfrac{4x^3}{1 - x^4}$

805. If $y = \sqrt{\sin x + y}$, then $\dfrac{dy}{dx}$ equals (a) $\dfrac{\cos x}{2y - 1}$ (b) $\dfrac{\cos x}{1 - 2y}$ (c) $\dfrac{\sin x}{1 - 2y}$ (d) $\dfrac{\sin x}{2y - 1}$

806. If $y = \tan^{-1}\left(\dfrac{\sin x + \cos x}{\cos x - \sin x}\right)$, then $\dfrac{dy}{dx}$ is equal to (a) $\dfrac{1}{2}$ (b) 0 (c) 1 (d) none of these