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MATHS

BOOKS - RD SHARMA MATHS (HINGLISH)

DIFFERENTIATION

Solved Examples And Exercises

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

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

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3. Differentiate $\sin^{-1}x$ with respect to $\cos^{-1}\sqrt{1-x^2}$, if $-1 < ax < 1$

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4. Differentiate the following functions with respect to x

$e^{\sin\sqrt{x}}$

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5. Differentiate the following functions with respect to x

$\sin(\log x)$

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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 x : $\sin(3x + 5)$

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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:

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

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11. Differentiate the following functions with respect to $\tan 5x^{\circ}$

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

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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 $y\frac{dy}{dx} - x = 0$

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

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

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

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

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22. If $y = \sin^{-1}\left(\frac{2x}{1 + x^2}\right) + \sec^{-1}\left(\frac{1 + x^2}{1 - x^2}\right), 0 < x < 1,$ prove that $\frac{dy}{dx} = \frac{4}{1 + x^2}$

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

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

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

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

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27. Find $\frac{dy}{dx}$, 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: $\tan^{-1}\left(\frac{a + x}{1 - ax}\right)$

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

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30. Differentiate the following function with respect to x:

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

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

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32. 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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33. Differentiate the following function with respect to x:

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

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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 : $(\log x)^x + x^{\log x}$

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

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

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

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

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

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

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

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

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

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45. If $x^{y}y^{.x} = 1$, *provethat* $\frac{dy}{dx} = -\left(y\frac{y + x\log y}{x(y\log x + x)}\right.$

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46. If $xy^2 = 1$, prove that

$2\frac{dy}{dx} + y^3 = 0$

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

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

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

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

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

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52. Differentiate the following function with respect to x: $\cos^{-1}\left\{2x\sqrt{1-x^2}\right\}, \frac{1}{\sqrt{2}}$

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53. If $\sec\left(\frac{x+y}{x-y}\right) = a$, *provethat* $\frac{dy}{dx} = \frac{y}{x}$.

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54. Differentiate the following function with respect to x:

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

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55. Differentiate the following function with respect to x:

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

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

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

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

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59. If .

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60. If $x = 2\cos\theta - \cos 2\theta$ and $y = 2\sin\theta - \sin 2\theta$ Prove that $\frac{dy}{dx} = \tan\left(\frac{3\theta}{2}\right)$.

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61. If $x = \cos t$ and $y = \sin t$, prove that $\frac{dy}{dx} = \frac{1}{\sqrt{3}}$ at $t = \frac{2\pi}{3}$

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62. Differentiate the following functions with respect to $\cos(\log x)^2$

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

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

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

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

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

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

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

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

A. $\frac{12y - 16x + 4}{12x - 9y + 3}$

B. $\frac{12y + 16x + 4}{12x - 9y + 3}$

C. $\frac{12y - 16x + 4}{12x + 9y + 3}$

D. $\frac{12y + 16x + 4}{12x + 9y + 3}$

Answer: A

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

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71. Find $\frac{dy}{dx}$ in each of the following: $xy = c^2$

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72. Differentiate the following function with respect to x :

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

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73. Differentiate the following function with respect to x: `sin^(-1) {(x+sqrt(1-x^2))/(sqrt(2))},-1

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74. Differentiate the following function with respect to x: `t a n^(-1) ((2^x+1)/(1-4^x)),oo

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75. 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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76. Differentiate the following function with respect to x:

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

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

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

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

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

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

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

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

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

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

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87. If $y = e^x \wedge e^x + e^x \wedge x^e$, prove that

$$\frac{dy}{dx} = e^x \wedge e^x \overset{.e}{x} \wedge x\left\{\frac{e^x}{x} + e\overset{.}{\log} x\right\} + x^e \wedge e^x \overset{.e}{e} \wedge x\left\{\frac{1}{x} + \overset{.}{\log} x\right\} + e^x \wedge x^e x^x \wedge e x^{e-1}$$

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

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

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

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

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

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

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

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

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

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

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

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

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100. Differentiate the following functions with respect to $e^{\sin^{-1}\{2x\}}$

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

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102. Differentiate the following function $\sqrt{\tan^{-1}\left(\sqrt{x}\right)}$

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

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

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

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106. If $y = (\log\cos x \sin x)(\log\sin x \cos x) - 1 + \sin - 1\left(2\frac{x}{1 + x2}\right)$ then prove that $\left(\frac{dy}{dx}\right)atx = \frac{\pi}{4}is8\left(\frac{4}{\pi 2 + 16} - \frac{1}{\log e}2\right)$

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

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

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109. Differentiate $\sin^{-1}\sqrt{1 - x^2}$ with respect to . if `0

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

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

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

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

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

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

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

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117. Differentiate the following functions with respect to $\frac{e^x \log x}{x^2}$

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118. Differentiate the following functions with respect to x

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

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

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120. Differentiate $\sin^{-1}\left\{\frac{2^{x+1} \cdot 3^x}{1 + (36)^x}\right\}$ with respect to x.

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

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

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123. Differentiate the following function $\sqrt{\frac{1+\sin x}{1-\sin x}}$

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

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125. Differentiate the following functions with respect to $x\, e^{3x}\cos 2x$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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142. Differentiate the following functions with respect to $\log x\ 3$

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

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

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

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

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

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

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

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

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

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

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

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

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

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156. If $f, g, andh$ are differentiable functions of $xand(x) = \left|fgh(xf)'(xg)'(xh)'\left(x^{f^2}f\right)''\left(x^2 g\right)''\left(x^2 h\right)''\right|$ prove that

$\wedge(') = \left| fgff' g' h' \left(x^3 f''\right)' \left(x^3 g''\right)' \left(x^3 h''\right)' \right|$

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

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

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

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

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161. If $y = \frac{1}{1 + x^{a-b} + x^{c-b}} + \frac{1}{1 + x^{b-c} + x^{a-c}} + \frac{1}{1 + x^{b-a} + x^{c-a}}$, then (dy)/(dx) is equal to (a)1 (b) $(a + b + c)^{x+b+c-1}$ 0 (d) none of these

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162. If $\sin^{-1}\left(\frac{x^2 - y^2}{x^2 + y^2}\right) = \log a then \frac{dy}{dx}$ is equal to $\frac{x^2 - y^2}{x^2 + y^2}$ (b) $\frac{y}{x}$ (c) $\frac{x}{y}$ (d) none of these

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163. If $(1 + x)^n = c_0 + C_1 x + C_2 x^2 + \ + C_n x^n$,using derivative prove that $C_1 + 2C_2 + \ + nC_n = n.2^{n-1}$ $C_1 - 2C_2 + 3C_3 + \ + (-1)^{n-1} nC_n = 0$

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

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

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

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167. Differentiate the following functions with respect to x:

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

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168. Differentiate the following functions with respect to x: $\frac{\sec x - 1}{\sec x + 1}$

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

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

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171. Differentiate the following functions with respect to y:

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

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

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

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

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

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

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

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

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

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

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

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

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183. 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) $\frac{1}{\sqrt{a^2-x^2}}$

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184. Differentiate the following functions with respect to x: (i)$\log \sin x^2$ (ii) $e^{\sin\left(x^2\right)}$ (iii) $\sin\left(e^{x^2}\right)$

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

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

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

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

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

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

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

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

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

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

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195. If $y = a^x \wedge a^x \wedge (.) \wedge ((((\infty))))$, *provethat* $\frac{dy}{dx} = \frac{y^2 \log y}{x\left(1 - y \log x \log y\right)}$

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196. If $y = e^x \wedge + e^x \wedge + e^{((((\to \infty))))}$, *showthat* $\frac{dy}{dx} = \frac{y}{1 - y}$

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197. If $y = \left(\sqrt{x}\right)^{\sqrt{x}} \wedge \sqrt{x} \wedge (((\infty)))$, *showthat* $\frac{dy}{dx} = \frac{y^2}{x(2 - y \log x)}$

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198. If $y = x + \frac{1}{x + \frac{1}{x + \frac{1}{}}}$, prove that $\frac{dy}{dx} = \frac{y}{2y - x}$

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199. If $y = \dfrac{\sin x}{1 + \dfrac{\cos x}{1 + \dfrac{\sin x}{1 + \dfrac{\cos x}{1 + \to \infty}}}}$, *provethat* $\dfrac{dy}{dx} = \dfrac{(1 + y)\cos x + y\sin x}{1 + 2y + \cos x - \sin x}$

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200. 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 , $\dfrac{dy}{dx} + e^{y-x} = 0$

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

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202. If $y = \sqrt{\sin x + y}$,then find $\dfrac{dy}{dx}$.

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203. If $y = x^x \wedge x^{\ddot{\wedge}}((((\infty))))$, $\frac{dy}{dx}$

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

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205. If $x^y = y^x$, then find $\frac{dy}{dx}$

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

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

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208. If $y = \frac{ax^2}{(x-a)(x-b)(x-c)} + \frac{bx}{(x-b)(x-c)} + \frac{c}{x-c} + 1$ find $\frac{dy}{dx}$

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

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

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

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

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213. Differentiate: $(\log x)^x + x^{\log x}$

w i t h respect to x

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

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

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

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217. If $y = \left\{(\log)_{\cos x}\sin x\right\}\left\{(\log)_{\sin x}\cos x\right\}^{-1} + \sin^{-1}\left(\frac{2x}{1+x^2}\right)$, find $\frac{dy}{dx}$ at $x = \frac{\pi}{4}$

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

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

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

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221. if $x^2 + y^2 = t - \frac{1}{t}$ and $x^4 + y^4 = t^2 + \frac{1}{t^2}$ then prove that $\frac{dy}{dx} = \frac{1}{x^3 y}$

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

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

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

$x \in (0, 1)$ (ii) $x \in (-1, 0)$ $x \in (1, \infty)$ (iv) $x \in (1, \infty)$

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225. Differentiate the functions with respect to x:

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

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226. Differentiate the functions with respect to x:

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

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

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

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

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230. If `y=cos^(-1)(2x)+2cos^(-1)sqrt(1-4x^2),-1/2

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231. If $\sqrt{1 - x^6} + \sqrt{1 - y^6} = a\left(x^3 - y^3\right), provethat \frac{dy}{dx} = \frac{x^2}{y^2}\sqrt{\frac{1 - y^6}{1 - x^6,}}$ w h e r e-

1x,1a n d-1

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

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

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234. Differentiate $\tan^{-1}\left(\frac{3x - x^3}{1 - 3x^2}\right)$, if $-\frac{1}{\sqrt{3}} < x < \frac{1}{\sqrt{3}}(2)x > \frac{1}{\sqrt{3}}(3)$. x lt-1/sqrt(3)`

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235. Differentiate each of the following functions with respect to x: (i) $\sin^{-1}\left(2x\sqrt{1 - x^2}\right), -\frac{1}{\sqrt{2}} < x < 1$

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236. Differentiate the following function with respect to x:

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

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

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237. Differentiate $\sin^{-1}\left(2x\sqrt{1-x^2}\right)$ *withrespec* $\otimes$, if `-1/(sqrt(2))

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238. Differentiate $\sin^{-1}\left(3x-4x^3\right)$

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

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240. If $y=\cos^{-1}\left\{x\sqrt{1-x}+\sqrt{x}\sqrt{1-x^2}\right\}$ and 0

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

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

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

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

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245. If $y = \frac{1}{2}\log\left(\frac{1 - \cos 2x}{1 + \cos 2x}\right)$, $prove that \frac{dy}{dx} = 2\cos ec 2x$

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

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

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

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249. $Provethat \frac{d}{dx}\left\{\frac{x}{2}\sqrt{a^2 - x^2} + \frac{a^2}{2}\frac{\sin^{-1}x}{a}\right\} = \sqrt{a^2 - x^2}$

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

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251. Differentiate the following functions with respect to x:

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

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252. Differentiate the following functions with respect to x:

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

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253. Differentiate the following functions with respect to x:

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

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254. Differentiate the following functions with respect to x

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

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

pi/2-1`

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255. Differentiate the following functions with respect to x :

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

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256. Differentiate the following functions with respect to x :

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

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257. Differentiate the following functions with respect to x :

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

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258. Differentiate the following functions with respect to x :

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

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259. 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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260. 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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261. Differentiate the following functions with respect to x: $\tan^{-1}\left(\frac{a-x}{a+x}\right)$

, $-a < x < a$

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262. Differentiate the following functions with respect to x:

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

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263. Differentiate the following functions with respect to x:

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

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

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265. Differentiate the following functions with respect to x :

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

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266. Differentiate the following functions with respect to x :

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

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267. Differentiate the following functions with respect to x :

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

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268. Differentiate the following functions with respect to x :

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

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269. Differentiate the following functions with respect to x :

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

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

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

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

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274. Differentiate $\frac{\sin x - x\cos x}{x\sin x + \cos x}$ with respect to x

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

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

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

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278. If $f(x) = |\log x|$, $x > 0$, find $f'(1/e)$ and $f'(e)$.

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

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

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

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

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283. Differentiate xe^x from first principles.

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284. Differentiate $\log\sin x$ by first principles.

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

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286. If $f(x) = x\tan^{-1}x$, find $f'(1)$ using the first principle.

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

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288. Differentiate $e^{\sqrt{\tan x}}$ from first principles

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

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

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

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292. Differentiate e^{3x} from first principles

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

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

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

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

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

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

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299. Differentiate $\log \cos ec\, x$ from first principal:

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

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

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

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

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

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

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306. Differentiate $\sin\left(e^{x^2}\right)$ with respect to x :

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

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

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

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

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

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

Watch Video Solution

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

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314. Differentiate $\sin^{-1}\left(\frac{a + b\cos x}{b + a\cos x}\right)$, $b > a$ with respect to x.

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315. Differentiate $e^e \wedge x$ with respect to x :

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

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

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

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

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

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

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

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323. Differentiate $\frac{e^x + e^{-x}}{e^x - e^{-x}}$ with respect to x .

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

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

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

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

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

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

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

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

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

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

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334. Differentiate $(\log)_{10}x + (\log)_x 10 + (\log)_x x + (\log)_{10}10$ with respect to x

.

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

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

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

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

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339. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \quad + C_n x^n$, using derivatives prove that

(I) $C_1 + 2C_2 + \quad + nC_n = n.2^{n-1}$

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

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340. Using the fact: $\sin(A+B) = \sin A \cos B + \cos A \sin B$ and the technique of differentiation, obtain the sum formula for cosines.

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

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

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

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

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

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

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

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

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349. Differentiate $(\log)_7(2x + 3)$ with respect to x :

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

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

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352. Differentiate $3^e \wedge x$ with respect to x :

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

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

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

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

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357. Differentiate $\sqrt{\frac{1 + \sin x}{1 - \sin x}}$ with respect to x .

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

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

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360. Differentiate $\sqrt{\frac{1+x}{1-x}}$ with respect to x .

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

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

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

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

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

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

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367. Differentiate $\log\sqrt{\frac{1 - \cos x}{1 + \cos x}}$ with respect to x :

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368. Differentiate $\tan\left(e^{\sin x}\right)$ with respect to x :

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

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370. Differentiate $\frac{e^x \log x}{x^2}$ with respect to x :

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371. Differentiate $\log(\text{cosec}\, x - \cot x)$ with respect to x :

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372. Differentiate $\frac{e^{2x} + e^{-2x}}{e^{2x} - e^{-2x}}$ with respect to x .

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

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

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

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

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

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

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

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

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

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

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

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384. Differentiate $e^x \log\sin 2x$ with respect to x .

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

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

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

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

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389. Differentiate $\frac{e^x \sin x}{\left(x^2+2\right)^3}$ with respect to x .

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

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

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392. Differentiate $\frac{x^2\left(1-x^2\right)^3}{\cos 2x}$ with respect to x .

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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414. Prove that $\frac{d}{dx}\left\{\frac{x}{2}\sqrt{a^2 - x^2} + \frac{a^2}{2}\frac{\sin^{-1}x}{a}\right\} = \sqrt{a^2 - x^2}$

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

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

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

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

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

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

$\theta \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$,

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

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422. Differentiate $\sin^{-1}\left(3x-4x^3\right)$ with respect to x, if $\frac{1}{2} < x < 1$

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423. Differentiate $\sin^{-1}\left(3x - 4x^3\right)$ with respect to x, if $-1 < x < -\frac{1}{2}$

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

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

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

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

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

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

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

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

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

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

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

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

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436. Differentiate $\tan^{-1}\left(\frac{3x - x^3}{1 - 3x^2}\right)$, if $x < -\frac{1}{\sqrt{3}}$

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

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

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

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

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

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

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

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

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445. Differentiate $\sec^{-1}\left(\frac{1}{2x^2-1}\right), 0 < x < \frac{1}{\sqrt{2}}$ with respect to x

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

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447. Differentiate $\cos^{-1}\left(2x\sqrt{1-x^2}\right), -\frac{1}{\sqrt{2}} < x < \frac{1}{\sqrt{2}}$

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448. Differentiate $\tan^{-1}\left\{\frac{1-\cos x}{\sin x}\right\}, -\pi < x < \pi$ with respect to x :

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

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450. Differentiate $\tan^{-1}\left\{\sqrt{\frac{1+\cos x}{1-\cos x}}\right\}$, 0

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

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452. Differentiate $\tan^{-1}\left\{\sqrt{\frac{1+\sin x}{1-\sin x}}\right\}, -\frac{\pi}{2} < x < \frac{\pi}{2}$ with respect to x :

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453. Differentiate $\tan^{-1}(\sec x + \tan x)$, $-\frac{\pi}{2} < x < \frac{\pi}{2}$ with respect to x :

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

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455. Differentiate the following functions with respect to x : (i) $\tan^{-1}\left\{\sqrt{1+x^2}-x\right\}, x \in \mathbb{R}$ (ii) $\tan^{-1}\left\{\frac{\sqrt{1+x^2}-1}{x}\right\}, \quad x \neq 0$

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456. Differentiate the following functions with respect to x: (i) $\tan^{-1}\left\{\frac{\sqrt{1+x^2}+1}{x}\right\}, \quad x \neq 0$ (ii) $\cot^{-1}\left\{\sqrt{1+x^2}+x\right\}$

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

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458. Differentiate the following functions with respect to x : (i) $\tan^{-1}\left(\frac{a+x}{1-ax}\right)$ (ii) $\tan^{-1}\left(\frac{a\cos x - b\sin x}{b\cos x + a\sin x}\right), -\frac{\pi}{2} < x < \frac{\pi}{2}$ and $\frac{a}{b}\tan x > -1$

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459. Differentiate $\tan^{-1}\left(\frac{3a^2x - x^3}{a^3 - 3ax^2}\right), -\frac{1}{\sqrt{3}} < \frac{x}{a} < \frac{1}{\sqrt{3}}$

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

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

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462. If $y = \cos^{-1}\left\{x\sqrt{1-x} + \sqrt{x}\sqrt{1-x^2}\right\}$ and $0 < x < 1$. Find $\frac{dy}{dx}$.

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

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

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

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

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

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

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

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

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

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472. Differentiate $\cos^{-1}\left\{2x\sqrt{1 - x^2}\right\}, \frac{1}{\sqrt{2}} < x < 1$

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

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

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

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

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

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478. Differentiate `sin^(-1)(2x^2-1),\ \ 0

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

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

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

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

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

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

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485. Differentiate the following function with respect to x: `sin^(-1){(x+sqrt(1-x^2))/(sqrt(2))},-1

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

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

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

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489. Differentiate `tan^(-1)((2a^x)/(1-a^(2x))),\ \ a >1,\ -oo

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

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491. 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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492. Differentiate `tan^(-1)((sinx)/(1+cosx)),\ -pi

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

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494. Differentiate `cos^(-1)((1-x^(2n))/(1+x^(2n))),\ \ 0

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

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

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

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498. Differentiate the following function with respect to x:

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

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

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

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

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

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503. Differentiate `tan^(-1){(cosx+sinx)/(cosx-sinx)},\ -pi/4

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

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

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506. If `y=sin^(-1)((2x)/(1+x^2))+sec^(-1)((1+x^2)/(1-x^2)),\ \ 0

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507. If `y=sin^(-1)(x/(sqrt(1+x^2)))+cos^(-1)(1/(sqrt(1+x^2))),\ \ 0

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

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

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

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

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

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

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514. If `y=cos^(-1)(2x)+2cos^(-1)sqrt(1-4x^2),\ \ 0

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

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516. If `y=cos^(-1)(2x)+2cos^(-1)sqrt(1-4x^2),-1/2

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

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

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

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520. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$, find $\frac{dy}{dx}$ and $\frac{dx}{dy}$. Also, show that $\frac{dy}{dx}\frac{dx}{dy} = 1$.

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

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

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

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

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

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526. If $\sin y = x\sin(a + y)$, prove that $\frac{dy}{dx} = \frac{s \in^2(a + y)}{\sin a}$.

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527. If $\sqrt{1 - x^6} + \sqrt{1 - y^6} = a^3\left(x^3 - y^3\right)$, $prove that \frac{dy}{dx} = \frac{x^2}{y^2}\sqrt{\frac{1 - y^6}{1 - x^6,}}$ w h e r

e-1x,1a n d-1

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

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

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530. If $y = \cos^{-1}\sqrt{\frac{\cos 3x}{\cos^3 x}}$, *then show that* $\frac{dy}{dx} = \sqrt{\frac{3}{\cos x \cos 3x}}$

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531. If $xy = c^2$, find $\frac{dy}{dx}$

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

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

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

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

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

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

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

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539. Find $\frac{dy}{dx}$ if, $\tan^{-1}\left(x^2+y^2\right)=a$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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555. If $\sin(xy) + \frac{y}{x} = x^2 - y^2$, find $\frac{dy}{dx}$.

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

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

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

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559. If $y = \left\{(\log)_{\cos x}\sin x\right\}\left\{(\log)_{\sin x}\cos x\right\}^{-1} + \sin^{-1}\left(\frac{2x}{1 + x^2}\right)$, find $\frac{dy}{dx}$ at $x = \frac{\pi}{4}$

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560. If $\sqrt{y + x} + \sqrt{y - x} = c$ show that $\frac{dy}{dx} = \frac{y}{x} - \sqrt{\left(\frac{y^2}{x^2}\right) - 1}$

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561. Differentiate the following functions with respect to x : (I)x^x (ii) $x^{\sin x}$

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

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

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

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

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

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

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

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

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

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

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

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

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

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575. Differentiate $\log\left(x^x + \operatorname{cosec}^2 x\right)$ with respect to x :

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

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

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

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579. If $x^y = y^x$, find $\frac{dy}{dx}$.

Watch Video Solution

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

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

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

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

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

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585. If $y = \frac{ax^2}{(x-a)(x-b)(x-c)} + \frac{bx}{(x-b)(x-c)} + \frac{c}{x-c} + 1$ find $\frac{dy}{dx}$

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

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

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

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

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

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

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

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593. 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.

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

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

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

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

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

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

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

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

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

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

Watch Video Solution

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

Watch Video Solution

605. Differentiate $x^{\tan^{-1}x}$ with respect to x :

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

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

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

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

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610. Differentiate $\left(x + \frac{1}{x}\right)^x + x^{1+\frac{1}{x}}$ with respect to x .

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

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

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

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614. Find $\frac{dy}{dx}$ if, $y = e^x + 10^x + x^x$

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

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

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

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

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

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620. Find $\frac{dy}{dx}$ if, $y = x^{\sin x} + \sin\left(x^x\right)$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Watch Video Solution

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

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

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

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

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

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

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

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

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

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

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

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

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647. 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 $f'(1)$

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

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

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

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

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

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

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

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

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

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

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658. If $y = x^x \wedge x\left(\left(\overset{\cdot}{\infty}\right)\right)$, find $\frac{dy}{dx}$.

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

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

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661. If $y = e^{x+e^{x+e^{x+\dot{\to}\infty}}}$, show that $\frac{dy}{dx} = \frac{y}{1-y}$.

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

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663. If $y = x + \cfrac{1}{x + \cfrac{1}{x + \cfrac{1}{x+\dot{.}}}}$, prove that $\frac{dy}{dx} = \frac{y}{2y-x}$.

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

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665. If $y = \sqrt{x + \sqrt{x + \sqrt{x + \quad \dot{\to} \quad \infty}}}$, prove that $\frac{dy}{dx} = \frac{1}{2y - 1}$

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666. If $y = \sqrt{\cos x + \sqrt{\cos x + \sqrt{\cos x + \quad \dot{\to} \quad \infty}}}$, prove that $\frac{dy}{dx} = \frac{\sin x}{1 - 2y}$.

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667. If $y = \sqrt{\log x + \sqrt{\log x + \sqrt{\log x + \quad \dot{\to} \quad \infty}}}$, prove that $(2y - 1)\frac{dy}{dx} = \frac{1}{x}$.

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668. If $y = \sqrt{\tan x + \sqrt{\tan x + \sqrt{\tan x + \quad \dot{\to} \quad \infty}}}$, prove that $\frac{dy}{dx} = \frac{sec^2 x}{2y - 1}$

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

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670. $\cos 6x = 32\cos^6 x - 48\cos^4 x + 18\cos^2 x - 1$

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671. If $y = e^x \wedge e^x + e^x \wedge x^e$, prove that

$$\frac{dy}{dx} = e^x \wedge e^x \overset{\cdot^{\cdot^{e}}}{x} \wedge x\left\{\frac{e^x}{x} + e \overset{\cdot}{\log} x\right\} + x^e \wedge e^x \overset{\cdot^{\cdot^{e}}}{e} \wedge x\left\{\frac{1}{x} + \overset{\cdot}{\log} x\right\} + e^x \wedge x^e x^x \wedge e x^{e-1}$$

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672. If $y = (\cos x)^{\cos x \wedge \left(\left((\cos x)^{\cdot^{\infty}}\right)\right)}$, prove that $\frac{dy}{dx} = -\frac{y^2 \tan x}{(1 - y \log \cos x)}$

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

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674. Find $\frac{dy}{dx}: x = a(\theta - \sin\theta)$ and $y = a(1 - \cos\theta)$

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

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676. Find $\frac{dy}{dx}$, when $x = a\cos^3 t$ and $y = a\sin^3 t$.

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677. If $x = \sqrt{a^{\sin} \wedge ((-1)t)}, y = \sqrt{a^{\cos} \wedge ((-1)t)}$, show that $\frac{dy}{dx} = -\frac{y}{x}$

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678. If $x = \sin^{-1}\left(\frac{2t}{1+t^2}\right) and y = \tan^{-1}\left(\frac{2t}{1-t^2}\right), t > 1.$ *Provethat* $\frac{dy}{dx} = -1$

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

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

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

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

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683. Find $\frac{dy}{dx}$, when $x = a\cos\theta$ and $y = b\sin\theta$

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

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

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686. Find $\frac{dy}{dx}$, when $x = a(1 - \cos\theta)$ and $y = a(\theta + \sin\theta)$ at $\theta = \frac{\pi}{2}$

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

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

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

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

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

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692. Find $\frac{dy}{dx}$, when $x = \frac{\cos^{-1}1}{\sqrt{1+t^2}}$ and $y = \frac{\sin^{-1}t}{\sqrt{1+t^2}}$, $t \in R$

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

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694. If $x = 2\cos\theta - \cos 2\theta$ and $y = 2\sin\theta - \sin 2\theta$, prove that $\frac{dy}{dx} = \tan\left(\frac{3\theta}{2}\right)$

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695. If $x = e^{\cos 2t}$ and $y = e^{\sin 2t}$, prove that $\frac{dy}{dx} = -\frac{y\log x}{x\log y}$

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696. If $x = \cos t$ and $y = \sin t$, prove that $\frac{dy}{dx} = \frac{1}{\sqrt{3}}$ at $t = \frac{2\pi}{3}$

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697. If $x = a\left(t + \frac{1}{t}\right)$ and $y = a\left(t - \frac{1}{t}\right)$, prove that $\frac{dy}{dx} = \frac{x}{y}$

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698. If $x = \sin^{-1}\left(\frac{2t}{1+t^2}\right)$ and $y = \tan^{-1}\left(\frac{2t}{1-t^2}\right)$, `-1

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

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

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

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

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

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

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

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

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

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

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

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710. Differentiate $\tan^{-1}\left(\frac{1+2x}{1-2x}\right)$ with respect to $\sqrt{1+4x^2}$.

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

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712. Differentiate $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ with respect to $\tan^{-1}x$, $-1 < x < 1$.

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

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

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

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

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717. Differentiate $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ with respect to $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$, if $x \in (-1, 1)$

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718. Differentiate $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ with respect to $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$, if $x \in (1, \infty)$

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719. Differentiate $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ with respect to $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$, if $x \in (-\infty, -1)$

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

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

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

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

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724. Differentiate $\sin^{-1}\sqrt{1-x^2}$ with respect to $\cos^{-1}x$, if $x \in \left(-\frac{1}{2\sqrt{2}}, \frac{1}{2\sqrt{2}}\right)$

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

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

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727. Differentiate $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ with respect to $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$, if $-1 < x < 1, x \neq 0$.

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728. Differentiate $\sin^{-1}\left(2x\sqrt{1-x^2}\right)$ with respect to $\sec^{-1}\left(\frac{1}{\sqrt{1-x^2}}\right)$, if $x \in \left(0, 1/\sqrt{2}\right)$

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729. Differentiate $\sin^{-1}\left(2x\sqrt{1-x^2}\right)$ with respect to $\sec^{-1}\left(\frac{1}{\sqrt{1-x^2}}\right)$, if $x \in \left(1/\sqrt{2}, 1\right)$

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

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

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

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

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

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

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

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

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738. Differentiate $\cos^{-1}\left(4x^3 - 3x\right)$ with respect to $\tan^{-1}\left(\frac{\sqrt{1-x^2}}{x}\right)$, if `1/2

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

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740. Differentiate $\sin^{-1}\sqrt{1-x^2}$ with respect to $\cot^{-1}\left(\frac{x}{\sqrt{1-x^2}}\right)$, if `0

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

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

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

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744. 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_____

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

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746. If $f, g, and h$ are differentiable functions of $x and (x) = \left| fgh(xf)'(xg)'(xh)' \left(x^{f^2} f\right)'' \left(x^2 g\right)'' \left(x^2 h\right)'' \right|$ prove that $\wedge(') = \left| fgff' g' h' \left(x^3 f''\right)' \left(x^3 g''\right)' \left(x^3 h''\right)' \right|$

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747. If $y = \begin{vmatrix} f(x) & g(x) & h(x) \\ l & m & n \\ a & b & c \end{vmatrix}$, prove that $\frac{dy}{dx} = \left| f'(x)g'(x)h'(x)lmnabc \right|$.

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

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

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

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751. 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 $x = 0$.

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

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753. 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 $g'(9)$.

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

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755. If $\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$ and $y = \sin^{-1}(\sin x)$, find $\frac{dy}{dx}$.

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756. If $\pi \leq x \leq 2\pi$ and $y = \cos^{-1}(\cos x)$, find $\frac{dy}{dx}$.

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757. If $y = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$, write the value of $\frac{dy}{dx}$ for $x > 1$.

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758. 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 $\frac{dy}{dx}$ at $x = 0$.

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

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

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

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762. If $\frac{\pi}{2} < x < 0$ and $y = \tan^{-1}\sqrt{\frac{1 - \cos 2x}{1 + \cos 2x}}$. find $\frac{dy}{dx}$

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

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

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

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

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

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

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769. If $|x| < 1$ and $y = 1 + x + x^2 + \ldots\ldots \infty$, then find the value of $\frac{dy}{dx}$.

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770. If $u = \sin^{-1}\left(\frac{2x}{1 + x^2}\right)$ and $v = \tan^{-1}\left(\frac{2x}{1 - x^2}\right)$, where $-1 < x < 1$, then write the value of $\frac{du}{dv}$.

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

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

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

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

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775. Write the derivative of $\sin x$ with respect to $\cos x$.

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776. 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

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

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778. 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) $6^{1/2}$

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

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780. If $y=\tan^{-1}\sqrt{\frac{1-\sin x}{1+\sin x}}$, then the value of $\frac{dy}{dx}$ at $x=\frac{\pi}{6}$ is.

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781. If $y=\left(1+\frac{1}{x}\right)^x$, then $\frac{dy}{dx}=$ (a) $\left(1+\frac{1}{x}\right)^x\left\{\log\left(1+\frac{1}{x}\right)-\frac{1}{x+1}\right\}$ (b) $\left(1+\frac{1}{x}\right)^x\log\left(1+\frac{1}{x}\right)$ (c) $\left(x+\frac{1}{x}\right)^x\left\{\log(x+1)-\frac{x}{x+1}\right\}$ (d) $\left(x+\frac{1}{x}\right)^x\left\{\log\left(1+\frac{1}{x}\right)+\frac{1}{x+1}\right\}$

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782. If $x^y = e^{x-y}$, then $\frac{dy}{dx}$ is (a) $\frac{1+x}{1+\log x}$ (b) $\frac{1-\log x}{1+\log x}$ (c) not defined (d) $\frac{\log x}{(1+\log x)^2}$

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783. Given $f(x) = 4x^8$, then (a) $f'\left(\frac{1}{2}\right) = f'\left(-\frac{1}{2}\right)$ (b) $f\left(\frac{1}{2}\right) = -f'\left(-\frac{1}{2}\right)$ (c) $f'\left(-\frac{1}{2}\right) = -f'\left(\frac{1}{2}\right)$ (d) $f\left(\frac{1}{2}\right) = f'\left(-\frac{1}{2}\right)$

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784. If $x = a\cos^3\theta$, $y = a\sin^3\theta$, then $\left(1+\left(\frac{dy}{dx}\right)^2\right) =$ (a) $\tan^2\theta$ (b) $\sec^2\theta$ (c) $\sec\theta$ (d) $|\sec\theta|$

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785. If $y = \sin^{-1}\left(\frac{1 - x^2}{1 + x^2}\right)$, then $\frac{dy}{dx} =$ (a)$-\frac{2}{1 + x^2}$ (b) $\frac{2}{1 + x^2}$ (c) $\frac{1}{2 - x^2}$ (d) $\frac{2}{2 - x^2}$

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786. The derivative of $\sec^{-1}\left(\frac{1}{2x^2 - 1}\right)$ with respect to $\sqrt{1 + 3x}$ at $x = -\frac{1}{3}$

(a) does not exist (b) 0 (c) 1/2 (d) 1/3

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787. For the curve $\sqrt{x} + \sqrt{y} = 1$, $\frac{dy}{dx}$ at $(1/4,\ 1/4)$ is (a)1/2 (b) 1 (c) -1 (d) 2

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788. If $\sin(x + y) = \log(x + y)$, then $\frac{dy}{dx} =$ (a) 2 (b) -2 (c) 1 (d) -1]

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789. Let $U = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ and $V = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$, then $\frac{dU}{dV} =$ (a) $1/2$ (b) x (c) $\frac{1-x^2}{1+x^2}$ (d) 1

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790. $\frac{d}{dx}\left\{\tan^{-}1\left(\frac{\cos x}{1+\sin x}\right)\right\}$ equals (a) $1/2$ (b) $-1/2$ (c) 1 (d) -1

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791. $\frac{d}{dx}\left[\log\left\{e^x\left(\frac{x-2}{x+2}\right)^{3/4}\right\}\right]$ equals $\frac{x^2-1}{x^2-4}$ (b) 1 (c) $\frac{x^2+1}{x^2-4}$ (d) $e^x\frac{x^2-1}{x^2-4}$

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

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793. If $3\sin(xy) + 4\cos(xy) = 5$, then $\frac{dy}{dx} =$ (a) $\frac{y}{x}$ (b) $\frac{3\sin(xy) + 4\cos(xy)}{3\cos(xy) - 4\sin(xy)}$ (c) $\frac{3\cos(xy) + 4\sin(xy)}{4\cos(xy) - 3\sin(xy)}$ (d) none

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794. If $\sin y = x\sin(a + y)$, then $\frac{dy}{dx}$ is (a) $\frac{\sin a}{\sin a \sin^2(a + y)}$ (b) $\frac{\sin^2(a + y)}{\sin a}$ (c) $\sin a \sin^2(a + y)$ (d) $\frac{\sin^2(a - y)}{\sin a}$

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795. The derivative of $\cos^{-1}\left(2x^2 - 1\right)$ with respect to $\cos^{-1}x$ is (a) 2 (b) $\frac{1}{2\sqrt{1 - x^2}}$ (c) $2/x$ (d) $1 - x^2$

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796. 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 $x \in R$ (d) none of these

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797. If $f(x) = \left|x^2 - 9x + 20\right|$, then $f'(x)$ is equal to (a) $-2x + 9$ for all $x \in R$ (b) $2x - 9$ if $4 < x < 5$ (c) $-2x + 9$ if $4 < x < 5$ (d) None of these

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798. 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

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799. 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

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800. If $f(x) = \left(\frac{x^l}{x^m}\right)^{l+m}\left(\frac{x^m}{x^n}\right)^{m+n}\left(\frac{x^n}{x^l}\right)^{n+l}$, then $f'(x)$ is equal to (a) 1 (b) 0 (c) x^{l+m+n} (d) none of these

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801. If $y = \frac{1}{1 + x^{a-b} + x^{c-b}} + \frac{1}{1 + x^{b-c} + x^{a-c}} + \frac{1}{1 + x^{b-a} + x^{c-a}}$, then $\frac{dy}{dx}$ is equal to (a)1 (b) $(a + b + c)^{x+b+c-1}$ 0 (d) none of these

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802. If $\sqrt{1 - x^6} + \sqrt{1 - y^6} = a\left(x^3 - y^3\right)$, then prove that $\frac{dy}{dx} = \frac{x^2}{y^2}\sqrt{\frac{1 - y^6}{1 - x^6}}$

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803. If $y = \log\sqrt{\tan x}$, then the value of $\frac{dy}{dx}$ at $x = \frac{\pi}{4}$ is given by (a)∞ (b) 1 (c) 0 (d) $\frac{1}{2}$

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804. If $\sin^{-1}\left(\frac{x^2 - y^2}{x^2 + y^2}\right) = \log a$ then $\frac{dy}{dx}$ is equal to (a) $\frac{x^2 - y^2}{x^2 + y^2}$ (b) $\frac{y}{x}$ (c) $\frac{x}{y}$ (d) none of these

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805. If $\sin y = x\cos(a + y)$, then $\frac{dy}{dx}$ is equal to (a) $\frac{\cos^2(a + y)}{\cos a}$ (b) $\frac{\cos a}{\cos^2(a + y)}$ (c) $\frac{\sin^2 y}{\cos a}$ (d) none of these

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806. If $y = \log\left(\frac{1 - x^2}{1 + x^2}\right)$, then $\frac{dy}{dx} =$ (a) $\frac{4x^3}{1 - x^4}$ (b) $-\frac{4x}{1 - x^4}$ (c) $\frac{1}{4 - x^4}$ (d) $-\frac{4x^3}{1 - x^4}$

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

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808. If $y = \tan^{-1}\left(\frac{\sin x + \cos x}{\cos x - \sin x}\right)$, then $\frac{dy}{dx}$ is equal to (a) $\frac{1}{2}$ (b) 0 (c) 1 (d) none of these

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