



MATHS

BOOKS - RD SHARMA MATHS (ENGLISH)

HIGHER ORDER DERIVATIVES

Others

1. Find $\frac{d^2y}{dx^2}$, where $y = \log\left(\frac{x^2}{e^2}\right)$.



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2. If $x = \cos \theta, y = \sin^3 \theta$, prove that

$$y \frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 = 3 \sin^2 \theta (5 \cos^2 \theta - 1).$$



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3. If $y = e^x(\sin x + \cos x)$ prove that $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$.

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4. If $x = a(1 - \cos^3 \theta)$, $y = a \sin^3 \theta$, prove that $\frac{d^2y}{dx^2} = \frac{32}{27a}$ at $\theta = \frac{\pi}{6}$.

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5. If $x = a(\theta + \sin \theta)$, $y = a(1 + \cos \theta)$, Prove that $\frac{d^2y}{dx^2} = -\frac{a}{y^2}$

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6. If $x = 2 \cos t - \cos 2t$, $y = 2 \sin t - \sin 2t$, find $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{2}$.

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7. If $y = \log(1 + \cos x)$, prove that $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} \frac{dy}{dx} = 0$.

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

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9. If $x = \sin t$ and $y = \sin pt$, prove that

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

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10. If $x = a(\cos t + t \sin t)$ and $y = a(\sin t - t \cos t)$, then find the value

of $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{4}$

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11. If $y = (\cot^{-1} x)^2$, prove that $y_2(x^2 + 1)^2 + 2x(x^2 + 1)y_1 = 2$.

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

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13. If $x = \cos t + \frac{\log \tan t}{2}$, $y = \sin t$, then find the value of $\frac{d^2y}{dt^2}$ and $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{4}$.

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14. Find A and B so that $y = A \sin 3x + b \cos 3x$ satisfies the equation

$$\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 3y = 10 \cos 3x.$$

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15. If $x = a \sin t - b \cos t$, $y = a \cos t + b \sin t$, prove that

$$\frac{d^2y}{dx^2} = -\frac{x^2 + y^2}{y^3}$$

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16. If $y = e^{ex}(ax + b)$, show that $y'' - 4y' + 4y = 0$

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17. If $x = a \sec \theta$, $y = b \tan \theta$, prove that $\frac{d^2y}{dx^2} = -\frac{b^4}{a^2y^3}$

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18. If $y = e^{\tan^{-1}((-1)x)}$, prove that $(1 + x^2)y'' + (2x - 1)y' = 0$.

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19. If $y = (\sin^{-1} x)^2$, prove that $(1 - x^2)y_2 - xy_1 - 2 = 0$.



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20.

If

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



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21. If $x = \sin\left(\frac{1}{a} \log y\right)$, show that $(1 - x^2)y_2 - xy_1 - a^2y = 0$.



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22. If $y = x + \tan x$, show that $\cos^2 x \frac{d^2y}{dx^2} - 2y + 2x = 0$



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23. If $y = e^{-x} \cos x$, show that $\frac{d^2y}{dx^2} = 2e^{-x} \sin x$

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24. If $y = \log(\sin x)$, prove that $\frac{d^3}{dx^3} = 2 \cos x \operatorname{cosec}^3 x$.

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25. If $y = x^3 \log x$, prove that $\frac{d^4y}{dx^4} = \frac{6}{x}$.

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26. If $y = \frac{\log x}{x}$, show that $\frac{d^2y}{dx^2} = \frac{2 \log x - 3}{x^3}$

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27. If $y = 2 \sin x + 3 \cos x$, show that $\frac{d^2y}{dx^2} + y = 0$

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28. Find $\frac{d^2y}{dx^2}$, if $x = at^2$, $y = 2at$.

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29. If $x = \sin \theta$, $y = \cos p\theta$, prove that $(1 - x^2)y_2 - xy_1 + p^2y = 0$, where $y_2 = \frac{d^2y}{dx^2}$ and $y_1 = \frac{dy}{dx}$

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30. If $y = \tan^{-1} x$ find $\frac{d^2y}{dx^2}$ in terms of y alone.

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31. If $x^m y^n = (x + y)^{m+n}$, prove that $\frac{d^2 y}{dx^2} = 0$

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32. If $y^3 - y = 2x$, prove that $\frac{d^2 y}{dx^2} = \frac{-24y}{(3y^2 - 1)^3}$

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33. If $y = x^x$, find $\frac{d^2 y}{dx^2}$

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34. If $y = \sin^{-1} x$, show that $\frac{d^2 y}{dx^2} = \frac{x}{(1 - x^2)^{\frac{3}{2}}}$

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35. If $y = A \cos nx + B \sin nx$, show that $\frac{d^2 y}{dx^2} + n^2 y = 0$



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36. If $y = \tan x + \sec x$, prove that $\frac{d^2y}{dx^2} = \frac{\cos x}{(1 - \sin x)^2}$



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37. If $y = \frac{ax + b}{x^2 + c}$, then $(2xy_1 + y)y_3 =$



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38. If $y = (\log)_e \left(\frac{x}{a} \right)^x$, then $x^3 y_2 =$ (a) $(xy_1 - y)^2$ (b) $\left(\frac{y - xy_1}{y_1} \right)^2$ (c)

none of these



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39. If $\sin^{-1} x + \sin^{-1}(1 - x) = \sin^{-1} \sqrt{1 - x^2}$, then x is equal to



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40. If $y = \frac{2}{\sqrt{a^2 - b^2}} \tan^{-1} \left\{ \sqrt{\frac{a-b}{a+b}} \tan\left(\frac{x}{2}\right) \right\}$, then show that

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



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41. If $y = x^{n-1} \ln x$ then $x^2 y_2 + (3 - 2n)xy_1$ is equal to (a) $-(n-1)^2 y$
 (b) $(n-1)^2 y$ (c) $-n^2 y$ (d) $n^2 y$



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42. If $xy - (\log)_e y = 1$ satisfies the equation $x(yy_2 + y_1^2) - y_2 + \lambda yy_1 = 0$, then $\lambda =$ -3 (b) 1 (c) 3 (d) none of these



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43.

If

$x = f(t)\cos t - f'(t)\sin t$ and $y = f(t)\sin t + f'(t)\cos t$, then $\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 =$

A. (a) $f(t) - f''(t)$

B. (b) $\{f(t) - f''(t)\}^2$

C. (c) $\{f(t) + f''(t)\}^2$

D. (d) none of these

Answer: null**Watch Video Solution**

44. If $\frac{d}{dx} \{x^n - a_1x^{n-1} + a_2x^{n-2} + \dots + (-1)^n a_n\} e^x = x^n e^x$, then the value of a_r , $0 < r \leq n$, is equal to

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45. If $x = f(t)$ and $y = g(t)$, then $\frac{d^2y}{dx^2}$ is equal to



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46. Let $f(x)$ be a polynomial. Then, the second order derivative of $f(e^x)$ is



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47. If $y = \tan^{-1} \left(\frac{\log\left(\frac{e}{x^2}\right)}{\log(ex^2)} \right) + \tan^{-1} \left(\frac{3 + 2 \log x}{1 - 6 \log x} \right)$, then $\frac{d^2y}{dx^2}$ is (a)

2 (b) 1 (c) 0 (d) -1



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48. If $f(x) = \frac{\sin^{-1} x}{\sqrt{1-x^2}}$, then $(1-x^2)f^x - xy(x) = 1$ (b) -1 (c) 0 (d)

none of these



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49.

If

$$f(x) = (\cos x + i \sin x)(\cos 2x + i \sin 2x)(\cos 3x + i \sin 3x) \dots (\cos nx + i \sin nx)$$

and $f(1) = 1$, then $f''(1)$ is equal to

A. (a) $\frac{n(n+1)}{2}$

B. (b) $\left\{ \frac{n(n+1)}{2} \right\}^2$

C. (c) $-\left\{ \frac{n(n+1)}{2} \right\}^2$

D. (d) none of these

Answer: null



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50. $\frac{d^{20}}{dx^{20}}(2 \cos x \cos 3x)$ is equal to (a) $2^{20}(\cos 2x - 2^{20} \cos 3x)$ (b) $2^{20}(\cos 2x + 2^{20} \cos 4x)$ (c) $2^{20}(\sin 2x + 2^{20} \sin 4x)$ (d) $2^{20}(\sin 2x - 2^{20} \sin 4x)$



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51. If $x = a \cos nt - b \sin nt$, then $\frac{d^2x}{dt^2}$ is n^2x (b) $-n^2x$ (c) $-nx$ (d) nx



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52. Find order & degree of equation

$$xy \left(\frac{d^2y}{dx^2} \right) + x \left(\frac{dy}{dx} \right)^2 - y \left(\frac{dy}{dx} \right) = 0,$$



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53. In $\frac{dy}{dx}$, x is a independent variable and y is the dependent variable. If

independent and dependent variables are interchanged $\frac{dy}{dx}$ becomes

$\frac{dx}{dy}$ and these two are connected by the relation $\frac{dy}{dx} \frac{dx}{dy} = 1$. Find a

relation between $\frac{d^2y}{dx^2}$ and $\frac{d^2x}{dy^2}$.



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54. If $y^2 = a^2 \cos^2 x + b^2 \sin^2 x$, then prove that $\frac{d^2y}{dx^2} + y = \frac{a^2b^2}{y^3}$



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55. If $y = \sin^{-1} x$, show that $\frac{d^2y}{dx^2} = \frac{x}{(1-x^2)^{3/2}}$



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56. If $y = A \cos nx + B \sin nx$, show that $\frac{d^2y}{dx^2} + n^2 y = 0$.



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57. If $y = Ae^{mx} + Be^{nx}$, show that $\frac{d^2y}{dx^2} - (m+n)\frac{dy}{dx} + mny = 0$.



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58. If $y = A \cos(\log x) + B \sin(\log x)$, prove that

$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = 0.$$

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59. If $y = \tan x + \sec x$, prove that $\frac{d^2 y}{dx^2} = \frac{\cos x}{(1 - \sin x)^2}$

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60. If $y = \tan x$, prove that $y_2 = 2yy_1$.

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61. If $y = \tan^{-1} x$, find $\frac{d^2 y}{dx^2}$ in terms of y alone.

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62. If $x^m y^n = (x + y)^{m+n}$, prove that $\frac{d^2 y}{dx^2} = 0$.

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63. If $y^3 - y = 2x$, prove that $\frac{d^2 y}{dx^2} = -\frac{24y}{(3y^2 - 1)^3}$.

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64. If $e^y(x + 1) = 1$. Show that $\frac{d^2 y}{dx^2} = \left(\frac{dy}{dx}\right)^2$

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65. If $y = x^x$, find $\frac{d^2 y}{dx^2}$.

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66. If $y = x \log \left\{ \frac{x}{(a + bx)} \right\}$, then show that $x^3 \frac{d^2 y}{dx^2} = \left(x \frac{dy}{dx} - y \right)^2$.

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67. If $y = \log \left\{ x + \sqrt{x^2 + a^2} \right\}$, prove that: $(x^2 + a^2) \frac{d^2y}{dx^2} + x \frac{dy}{dx} = 0$.

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68. If $y = \sin^{-1} x$, then show that $(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} = 0$.

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69. If $y = e^m \sin^{(-1)x}$, prove that $(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} - m^2 y = 0$.

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70. If $y = \left\{ x + \sqrt{x^2 + 1} \right\}^m$, show that $(x^2 + 1)y_2 + xy_1 - m^2 y = 0$

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71. If $y = \frac{\sin^{-1} x}{\sqrt{1-x^2}}$, show that $(1-x^2) \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} - y = 0$.

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72. If $x = \tan\left(\frac{1}{a} \log y\right)$, show that $(1+x^2) \frac{d^2y}{dx^2} + (2x-a) \frac{dy}{dx} = 0$.

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

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74. Find $\frac{d^2y}{dx^2}$, if $x = at^2$, $y = 2at$.

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75. If $x = a \cos^3 \theta$ and $y = a \sin^3 \theta$, then find the value of $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{6}$.

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76. If $x = a \sin t$ and $y = a \left(\cos t + \log \tan \left(\frac{t}{2} \right) \right)$, find $\frac{d^2y}{dx^2}$.

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77. If $x = a \cos \theta + b \sin \theta$, $y = a \sin \theta - b \cos \theta$ then show that

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

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78. If $x = \sin t$, $y = \sin pt$, prove that $(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} + p^2 y = 0$.

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79. If $x = \sin \theta$, $y = \cos p\theta$, prove that $(1 - x^2)y_2 - xy_1 + p^2y = 0$,

where $y_2 = \frac{d^2y}{dx^2}$ and $y_1 = \frac{dy}{dx}$.

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80. If $(x - a)^2 + (y - b)^2 = c^2$, for some $c > 0$, prove that

$$\frac{\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$$
 is a constant independent of a and b .

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81. If $y^2 = a^2 \cos^2 x + b^2 \sin^2 x$ then prove that $\frac{d^2y}{dx^2} + y = \frac{a^2b^2}{y^3}$

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82. If $f(x) = |x|^3$, show that $f(x)$ exists for all real x and find it.

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83. In $\frac{dy}{dx}$, x is independent variable and y is the dependent variable. If independent and dependent variables are interchanged $\frac{dy}{dx}$ becomes $\frac{dx}{dy}$ and these two are connected by the relation $\frac{dy}{dx} \frac{dx}{dy} = 1$. Find a relation between $\frac{d^2y}{dx^2}$ and $\frac{d^2x}{dy^2}$

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84. In $\frac{dy}{dx}$, x is a independent variable and y is the dependent variable. If independent and dependent variables are interchanged $\frac{dy}{dx}$ becomes $\frac{dx}{dy}$ and these two are connected by the relation $\frac{dy}{dx} \frac{dx}{dy} = 1$. Find a relation between $\frac{d^2y}{dx^2}$ and $\frac{d^2x}{dy^2}$.

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85. Find second order derivative of $x^3 + \tan x$

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86. Find second order derivative of $\sin(\log x)$

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87. Find second order derivative of $\log(\sin x)$

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88. Find second order derivative of $e^x \sin 5x$

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89. Find second order derivative of $e^{6x} \cos 3x$

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90. Find second order derivative of $x^3 \log x$



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91. Find second order derivative of $\tan^{-1} x$



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92. Find second order derivative of $x \cos x$



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93. Find second order derivative of $\log(\log x)$



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94. If $y = e^{-x} \cos x$, show that $\frac{d^2 y}{dx^2} = 2e^{-x} \sin x$.



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95. If $y = x + \tan x$, show that $\cos^2 x \frac{d^2 y}{dx^2} - 2y + 2x = 0$.

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96. If $y = x^3 \log x$, prove that $\frac{d^4 y}{dx^4} = \frac{6}{x}$.

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97. If $y = \log(\sin x)$, prove that $\frac{d^3 y}{dx^3} = 2 \cos x \operatorname{cosec}^3 x$.

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98. If $y = 2 \sin x + 3 \cos x$, show that $\frac{d^2 y}{dx^2} + y = 0$.

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99. If $y = \frac{\log x}{x}$, show that $\frac{d^2y}{dx^2} = \frac{2 \log x - 3}{x^3}$.

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100. If $x = a \sec \theta$, $y = b \tan \theta$, prove that $\frac{d^2y}{dx^2} = -\frac{b^4}{a^2 y^3}$.

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101. If $x = a(\cos \theta + \theta \sin \theta)$, $y = a(\sin \theta - \theta \cos \theta)$, prove that $\frac{d^2x}{d\theta^2} = a(\cos \theta - \theta \sin \theta)$, $\frac{d^2y}{d\theta^2} = a(\sin \theta + \theta \cos \theta)$ and $\frac{d^2y}{dx^2} = \frac{\sec^3 \theta}{a \theta}$

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

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103. If $x = a \cos \theta$, $y = b \sin \theta$, show that $\frac{d^2y}{dx^2} = -\frac{b^4}{a^2y^3}$.

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104. If $x = a(1 - \cos^3 \theta)$, $y = a \sin^3 \theta$, prove that $\frac{d^2y}{dx^2} = \frac{32}{27a}$ at $\theta = \frac{\pi}{6}$.

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105. If $x = a(\theta + \sin \theta)$, $y = a(1 + \cos \theta)$, prove that $\frac{d^2y}{dx^2} = -\frac{a}{y^2}$.

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106. If $x = a(\theta - \sin \theta)$, $y = a(1 + \cos \theta)$ find $\frac{d^2y}{dx^2}$

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107. If $x = a(1 - \cos \theta)$, $y = a(\theta + \sin \theta)$, prove that $\frac{d^2y}{dx^2} = -\frac{1}{a}$ at $\theta = \frac{\pi}{2}$.

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108. If $x = a(1 + \cos \theta)$, $y = a(\theta + \sin \theta)$, prove that $\frac{d^2y}{dx^2} = \frac{-1}{a}$ at $\theta = \frac{\pi}{2}$.

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109. If $x = \cos \theta$, $y = s \epsilon^3 \theta$, prove that $y \frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 = 3 s \epsilon^2 \theta (5 \cos^2 \theta - 1)$.

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

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111. If $x = \sin t$, $y = \sin pt$, prove that $(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} + p^2y = 0$.

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112. If $y = (\sin^{-1} x)^2$, prove that $(1 - x^2)y_2 - xy_1 - 2 = 0$.

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113. If $y = e^{\tan^{-1} x}$, prove that $(1 + x^2)y_2 + (2x - 1)y_1 = 0$.

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114. If $y = 3 \cos(\log x) + 4 \sin(\log x)$, prove that $x^2y_2 + xy_1 + y = 0$.

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115. If $y = e^{2x}(ax + b)$, show that $y_2 - 4y_1 + 4y = 0$.

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116. If $x = \sin\left(\frac{1}{a}\log y\right)$, show that $(1 - x^2)y_2 - x y_1 - a^2 y = 0$.

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117. If $\log y = \tan^{-1} x$, show that $(1 + x^2)y_2 + (2x - 1)y_1 = 0$.

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118. If $y = \tan^{-1} x$, show that $(1 + x^2)\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} = 0$.

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

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120. If $y = (\tan^{-1} x)^2$, then prove that $(1 + x^2)^2 y_2 + 2x (1 + x^2) y_1 = 2$.

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121. If $y = \cot x$ show that $\frac{d^2y}{dx^2} + 2y \frac{dy}{dx} = 0$.

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122. Find $\frac{d^2y}{dx^2}$, where $y = \log \left(\frac{x^2}{e^2} \right)$.

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123. If $y = ae^{2x} + be^{-x}$, show that, $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 0$.

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124. If $y = e^x(\sin x + \cos x)$ prove that $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$.

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125. If $y = \cos^{-1} x$, find $\frac{d^2y}{dx^2}$ in terms of y alone.

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126. If $y = e^{a\cos^{-1} x}$, $-1 \leq x \leq 1$, show that

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

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127. If $y = 500 e^{7x} + 600 e^{-7x}$, show that $\frac{d^2y}{dx^2} = 49y$.



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128. If $x = 2 \cos t - \cos 2t$, $y = 2 \sin t - \sin 2t$, find $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{2}$.



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129. If $x = 4z^2 + 5$, $y = 6z^2 + 7z + 3$, find $\frac{d^2y}{dx^2}$.



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130. If $y = \log(1 + \cos x)$, prove that $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} \frac{dy}{dx} = 0$.



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131. If $y = \sin(\log x)$, prove that $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = 0$.



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132. If $y = 3e^{2x} + 2e^{3x}$, prove that $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$.



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133. If $y = (\cot^{-1} x)^2$, prove that $y_2(x^2 + 1)^2 + 2x(x^2 + 1)y_1 = 2$.



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134. If $y = \operatorname{cosec}^{-1} x$, $x > 1$, then show that

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



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135. If $x = \cos t + \log \tan\left(\frac{t}{2}\right)$, $y = \sin t$, then find the value of $\frac{d^2y}{dt^2}$ and $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{4}$.



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136. If $x = a \sin t$ and $y = a \left(\cos t + \log \tan \left(\frac{t}{2} \right) \right)$, find $\frac{d^2y}{dx^2}$.



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137. If $x = a(\cos t + t \sin t)$ and $y = a(\sin t - t \cos t)$, then find the value of $\frac{dy}{dx}$.



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138. If $x = a \left(\cos t + \log \tan \left(\frac{t}{2} \right) \right)$, $y = a \sin t$, evaluate $\frac{dy}{dx}$.



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139. If $x = a(\cos 2t + 2t \sin 2t)$ and $y = a(\sin 2t - 2t \cos 2t)$, then find $\frac{dy}{dx}$.



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140. If $x = a \sin t - b \cos t$, $y = a \cos t + b \sin t$, find $\frac{dy}{dx}$.



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141. Find A and B so that $y = A \sin 3x + B \cos 3x$ satisfies the equation

$$\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 3y = 10 \cos 3x.$$



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142. If $y = Ae^{-kt} \cos(pt + c)$, then prove that $\frac{d^2y}{dt^2} + 2k\frac{dy}{dt} + n^2y = 0$, where $n^2 = p^2 + k^2$



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143. If $y = a \cos(\log x)$, find $\frac{dy}{dx}$.



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144. If $y = a \left[x + (x^2 - 1)^{\frac{1}{2}} \right]^n + b \left[x - (x^2 - 1)^{\frac{1}{2}} \right]^n$ the value of the expression $(x^2 - 1) \frac{d^2y}{dx^2} + x \frac{dy}{dx} - n^2y$ is _____.



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145. If $y = a x^{n+1} + b x^{-n}$ find $(dy)/(dx)$.



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146. If $x = a \cos nt - b \sin nt$ and $\frac{d^2x}{dt^2} = \lambda x$, then find the value of λ .



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147. If $x = t^2$ and $y = t^3$, find $\frac{d^2y}{dx^2}$.



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148. If $x = 2at$, $y = at^2$, where a is a constant, then find $\frac{d^2y}{dx^2}$ at $x = \frac{1}{2}$

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149. If $x = f(t)$ and $y = g(t)$, then write the value of $\frac{d^2y}{dx^2}$.

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150. If $y = 1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \frac{x^4}{4!} \rightarrow \infty$, then write $\frac{d^2y}{dx^2}$ in terms of y .

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151. If $y = x + e^x$, find $\frac{d^2x}{dy^2}$.

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152. If $y = (x - x^2)$, then find $\frac{d^2y}{dx^2}$.

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153. If $y = \log x$, find $\frac{d^2y}{dx^2}$.

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154. If $x = a \cos nt - b \sin nt$, then find $\frac{dx}{dt}$

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155. If $x = at^2$, $y = 2at$, then find $\frac{dy}{dx}$

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156. If $y = ax^{n+1} + bx^{-n}$, then $x^2 \frac{d^2y}{dx^2} = n(n-1)y$ (b) $n(n+1)y$ (c) ny (d) n^2y

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157. $\frac{d^{20}}{dx^{20}}(2 \cos x \cos 3x) = 2^{20}(\cos 2x - 2^{20} \cos 4x)$ (b)
 $2^{20}(\cos 2x + 2^{20} \cos 4x)$ (c) $2^{20}(\sin 2x + 2^{20} \sin 4x)$ (d)
 $2^{20}(\sin 2x - 2^{20} \sin 4x)$

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158. If $x = t^2$, $y = t^3$, then $\frac{dy}{dx}$

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159. If $y = a + bx^2$, a , b arbitrary constants, then find dy/dx

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160.

If

$$f(x) = (\cos x + i \sin x)(\cos 2x + i \sin 2x)(\cos 3x + i \sin 3x) \dots (\cos nx + i \sin nx)$$

and $f(1) = 1$, then $f'(1)$ is equal to $\frac{n(n+1)}{2}$ (b) $\left\{ \frac{n(n+1)}{2} \right\}^2$ (c)

$-\left\{ \frac{n(n+1)}{2} \right\}^2$ (d) none of these



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161. If $y = a \sin mx + b \cos mx$, then find $\frac{dy}{dx}$



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162. If $f(x) = \frac{\sin^{-1} x}{\sqrt{1-x^2}}$, then $(1-x^2)f'(x) - xf(x) =$ (a) 1 (b) -1 (c) 0

(d) none of these



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163. If $y = \tan^{-1} \left\{ \frac{(\log)_e (e/x^2)}{(\log)_e (ex^2)} \right\} + \tan^{-1} \left(\frac{3 + 2(\log)_e x}{1 - 6(\log)_e x} \right)$, then

$$\frac{d^2y}{dx^2} = \text{(a) 2 (b) 1 (c) 0 (d) -1}$$

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164. Let $f(x)$ be a polynomial. Then, the second order derivative of $f(e^x)$ is $f(e^x)e^{2x} + f'(e^x)e^x$ (b) $f(e^x)e^x + f'(e^x)$ (c) $f(e^x)e^{2x} + f'(e^x)e^x$ (d) $f(e^x)$

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165. If $y = a \cos((\log x) + b \sin((\log x))$, then find dy/dx

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166. If $x = 2$ and $y = at^2$, then find dy/dx

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167. If $x = f(t)$ and $y = g(t)$, then find $\frac{dy}{dx}$

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168. If $y = \sin(m \sin^{-1} x)$, then $(1 - x^2)y_2 - xy_1$ is equal to m^2y (b) my (c) $-m^2y$ (d) none of these

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169. If $y = (\sin^{-1} x)^2$, then $(1 - x^2)y_2$ is equal to $xy_1 + 2$ (b) $xy_1 - 2$ (c) $xy_1 + 2$ (d) none of these

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170. If $y = e^{\tan x}$, then $(\cos^2 x)y_2 - (1 + \sin 2x)y_1 = 0$

A. (a) $(1 - \sin 2x)y_1$

B. (b) $-(1 + \sin 2x)y_1$

C. (c) $(1 + \sin 2x)y_1$

D.

Answer: null

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171. If $y = \frac{2}{\sqrt{a^2 - b^2}} \left\{ \tan^{-1} \sqrt{\frac{a-b}{a+b}} \tan\left(\frac{x}{2}\right) \right\}$, then show that

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

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172. If $y = \frac{ax + b}{x^2 + c}$, prove that $(2xy_1 + y)y_3 = 3(xy_2 + y_1)y_2$.

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173. If $y = \log_e \left(\frac{x}{a + bx} \right)^x$, then $x^3 y_2$ is

(a) $(xy_1 - y)^2$

(b) $(1 + y)^2$

(c) $\left(\frac{y - xy_1}{y_1} \right)^2$

(d) none of these



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174. If $x = f(t)\cos t - f'(t)\sin t$ and $y = f(t)\sin t + f'(t)\cos t$, then

$\left(\frac{dx}{dt} \right)^2 + \left(\frac{dy}{dt} \right)^2 =$ (a) $f(t) - f''(t)$ (b) $\{f(t) - f''(t)\}^2$ (c)

$\{f(t) + f''(t)\}^2$ (d) none of these



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175. If $y^{\frac{1}{n}} + y^{-\frac{1}{n}} = 2x$ then $(x^2 - 1)y_2 + xy_1$ is equal to



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176. differentiate $y = \sin x + \log x$ with respect to x

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177. If $y = x \log x$ then find dy/dx

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178. find dy/dx if $xy - (\log y) = 1$

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179. If $y^2 = ax^2 + bx + c$, then find $(dy)/(dx)$

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