



MATHS

BOOKS - TELUGU ACADEMY MATHS (TELUGU ENGLISH)

DIFFERENTIATION

Exercise Vsaq

1. If $f(x) = a^x \cdot e^{x^2}$ then find $f'(x)$.

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2. If $f(x) = e^{2x} \cdot \log x$, ($x > 0$) then find $f'(x)$.

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3. If $y = e^{2x} \cdot \log(3x + 4)$ then find $\frac{dy}{dx}$.

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4. Find the derivative of $\sin mx \cdot \cos nx$.

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5. Find the derivative of $y = \sin^m x \cdot \cos^n x$.

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6. Find the derivative of $y = (ax + b)^a \cdot (cx + d)^m$.

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7. If $f(x) = xe^x \sin x$ then find $f'(x)$.

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8. Find the derivative of $x^n n^x \log(nx)$, ($x > 0$, $n \in \mathbb{N}$).

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9. Find the derivative of $y = \frac{ax + b}{cx + d} [|c| + |d| \neq 0]$.

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10. Find the derivative of $y = \frac{px^2 + qx + r}{ax + b}$.

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11. $\frac{1}{ax^2 + bx + c}$

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12. Find the derivative of $y = \frac{\cos x}{\sin x + \cos x}$.

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13. Find the derivative of $y = \frac{\sin(x + a)}{\cos x}$.

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14. Find the derivative of $y = \frac{\sin(ax + b)}{\cos(cx + d)}$.

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15. If $f(x) = \sin(\log x)$, ($x > 0$) then find $f'(x)$.

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16. Find the derivative of $y = \sin[\cos(x^2)]$.

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17. Find derivative of $\cos(\log x + e^x)$, $x > 0$ w.r.t. to x

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18. Find the derivative of $y = \cos[\log(\cot x)]$.

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19. Find the derivative of $7^{x^3 + 3x}$.

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20. Find the derivative of $\log\left(\frac{x^2 + x + 2}{x^2 - x + 2}\right)$ w.r.to x .

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21. If $y = \log(\cosh 2x)$, then find $\frac{dy}{dx}$.

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22. Find the derivative of $\log(\sec x + \tan x)$.

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23. If $y = \log(\tan 5x)$, the find $\frac{dy}{dx}$.

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24. Find the derivative of $\log(\sin(\log x))$.

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25. Find the derivative of $y = \log(\log x)$.

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26. Find $\frac{d}{dx}(\sec \sqrt{\tan x})$.

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27. Find the derivative of $y = \sqrt{2x - 3} + \sqrt{7 - 3x}$.

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28. Find the derivative of $(x^3 + 6x^2 + 12x - 13)^{100}$

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

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30. If $y = \tan^{-1}(\log x)$ then find $\frac{dy}{dx}$.

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31. $\sin^{-1}(3x - 4x^3)$

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32. Find the derivative of $y = x \tan^{-1} x$.

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33. Find the derivative of $y = \sin x (\sin^{-1} x)^2$.

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34. Find derivative $y = \sinh^{-1}\left(\frac{1-x}{1+x}\right)$.

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35. Find the derivative of $\sinh^{-1}\left(\frac{3x}{4}\right)$.

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36. Find the derivative of $\tan^{-1}\sqrt{\frac{1 - \cos x}{1 + \cos x}}$.

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37. Find the derivative of $y = e^{\sin^{-1}x}$.

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38. If $y = e^{a \sin^{-1}x}$ then prove that $\frac{dy}{dx} = \frac{ay}{\sqrt{1-x^2}}$.

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39. Find the derivative of $y = \tan^{-1}\left(\tanh \frac{x}{2}\right)$.

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40. Find the derivative of $y = \sin x \cdot (\tan^{-1} x)^2$.

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

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42. Find the derivative of $y = \cot^{-1}(\cos ec3x)$.

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43. If $f(x) = \log(\tan e^x)$, then find $f'(x)$.

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44. Find the derivative of $\log(\sin^{-1} e^x)$.

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45. If $y = (\cot^{-1} x^3)^2$ then find $\frac{dy}{dx}$.

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46. Find the derivative of x^x .

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47. Find the derivative of $y = x^y$.

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48. If $y = (\tan x)^{\sin x}$ then find dy/dx .

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49. Find $\frac{dy}{dx}$ if $x = a \cos^3 t$, $y = a \sin^3 t$.

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50. If $y = e^t + \cos t$, $x = \log t + \sin t$ then find $\frac{dy}{dx}$.

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51. If $x = 3 \cos t - 2 \cos^3 t$, $y = 3 \sin t - 2 \sin^3 t$ then find $\frac{dy}{dx}$.

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52. Find $\frac{dy}{dx}$ if $2x^2 - 3xy + y^2 + x + 2y - 8 = 0$.

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53. Find $\frac{dy}{dx}$ if $x^3 + y^3 - 3axy = 0$.

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54. If $y = \frac{2x + 3}{4x + 5}$ then find y'' .

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55. Find the second order derivative of $\tan^{-1}\left(\frac{3x - x^3}{1 - 3x^2}\right)$.

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56. If $y = ae^{nx} + be^{-nx}$, then prove that $y'' = n^2y$.

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57. If $y = a \cos x + (b + 2x)\sin x$, then show that $y'' + y = 4 \cos x$.

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Exercise Spq

1. If $y = x^2e^x \sin x$, then find $\frac{dy}{dx}$.

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2. Find the derivative of $20^{\log(\tan x)}$.

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3. If $y = \sin^{-1} \sqrt{x}$ find $\frac{dy}{dx}$.

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4. If $y = \tan^{-1}(\cos \sqrt{x})$ then find $\frac{dy}{dx}$.

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5. Find the derivative of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$.

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6. Find the derivative of $\cos^{-1}(4x^3 - 3x)$ w.r.to x .

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7. Find the derivative of $(\log x)^{\tan x}$.

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8. Find the derivative of $x^4 + y^4 - a^2xy = 0$.

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9. Find the second order derivative of $y = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$.

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10. Find the derivative of $\cot x$ from the first principle.

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11. Find the derivative of $\sin^2 x$ from the first principle.

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12. Find the derivative of x^3 from the first principle.

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13. Find the derivative of $ax^2 + bx + c$ from the first principle.

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14. Find the derivative of $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$.

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15. If $y = a \cos(\sin x) + b \sin(\sin x)$ then prove that $y'' + (\tan x)y' + y \cos^2 x = 0$.

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16. Find the derivative of (i) $(\sin x)^{\log x} + x^{\sin x}$.

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17. Find the derivative of (ii) $(\sin x)^x + x^{\sin x}$ w.r.to x .

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Exercise Saq

1. Find the derivative of $\sin 2x$ from the principle.

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2. Find the derivative of $\cos ax$ from the first Principle.

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3. Find the derivative of $\tan 2x$ from the first principle.

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4. Find the derivative of $\sec 3x$ using first principle.

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5. Find the derivative of $x \sin x$ from the first principle.

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6. Find the derivative of $\cos^2 x$ from the first principle.

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7. Find the derivative of $\sqrt{x+1}$ from the first principle.

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8. Using first principle, find the derivative of $\log_e x$ where $x \in (0, \infty)$.

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9. Find the derivative of $\tan^{-1}(\sec x + \tan x)$.

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10. Find the derivative of $\tan^{-1}\left(\frac{3a^2x - x^3}{a(a^2 - 3x^2)}\right)$.

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11. Find the derivative of $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$.

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

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13. If $y = ax^{n+1} + bx^{-n}$ then show that $x^2y'' = n(n+1)y$.

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14. If $y = \sin(\sin x)$ then show that $y'' + (\tan x)y' + y\cos^2 x = 0$.

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15. Show that $y = x + \tan x$ satisfies the equation

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

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16. If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$ then prove that

$$\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}.$$

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

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18. If $x^{\log y} = \log x$ then find $\frac{dy}{dx}$.

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19. If $x^y = y^x$ then show that $\frac{dy}{dx} = \frac{y(x \log y - y)}{x(y \log x - x)}$.

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20. If $y = x\sqrt{a^2 + x^2} + a^2 \log(x + \sqrt{a^2 + x^2})$, then show that $\frac{dy}{dx} = 2\sqrt{a^2 + x^2}$.

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21. Find the derivative of $x^{\tan x} + (\sin x)^{\cos x}$ w.r.to x .

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22. if $\sin y = x \sin(a + y)$ then show that $\frac{dy}{dx} = \frac{\sin^2(a + y)}{\sin a}$.

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

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24. If $x = a \left[\frac{1 - t^2}{1 + t^2} \right]$, $y = \frac{2bt}{1 + t^2}$ then find $\frac{dy}{dx}$.

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1. If $f(x) = 1 + x + x^2 + \dots + x^{100}$, then find $f'(1)$.

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2. Find the derivative of $x = \sinh^2 y$ with respect to x .

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3. Find the derivative of $x = e^{\sinh y}$ with respect to x .

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4. Find the derivative of $x = \tan(e^{-y})$ with respect to x .

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5. Find the derivative of $x = \log(1 + \sqrt{y})$ w.r. to x .

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6. Differentiate $f(x) = \log_a x$ with respect to $g(x) = a^x$.

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7. Prove that $\frac{d}{dx}uv = u\frac{dv}{dx} + v\frac{du}{dx}$.

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8. If $y^x = x^{\sin y}$ then find $\frac{dy}{dx}$.

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9. Find the derivative of $x^2 + (x)^x$ w.r. to x .

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10. If $x^y + y^x = a^b$ then prove that $\frac{dy}{dx} = - \left[\frac{yx^{y-1} + y^x \log y}{x^y \log x + xy^{x-1}} \right]$.

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11. Find the derivative of $\sin^{-1} \left(\frac{b + a \sin x}{a + b \sin x} \right)$ w.r. to x .

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12. If

$$f(x) = (a^2 - b^2)^{-1/2} \cdot \cos^{-1} \left(\frac{a \cos x + b}{a + b \cos x} \right) \quad a > b > 0 \text{ and } 0 < x < \pi$$

, then S.T $f'(x) = (a + b \cos x)^{-1}$.

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13. Find the derivative $\frac{dy}{dx}$ of the function

$$y = \frac{(1 - 2x)^{2/3}(1 + 3x)^{-3/4}}{(1 - 6x)^{5/6}(1 + 7x)^{-6/7}}.$$

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14. If $ay^4 = (x + b)^5$ then show that $5yy'' = (y')^2$.

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