

Test / Exam Name: Continuity And Differentiation

Standard: 12th Science

Subject: Mathematics

Instructions

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Q1. Differentiate $\sin^{-1} \left(4x\sqrt{1-4x^2} \right)$ with respect to $\sqrt{1-4x^2}$, if:
 $x \in \left(-\frac{1}{2\sqrt{2}}, \frac{1}{\sqrt{2\sqrt{2}}} \right)$

7 Marks

Q2. If $x = \frac{\sin^3 t}{\sqrt{\cos^2 t}}$, $y = \frac{\cos^3 t}{\sqrt{\cos 2t}}$, find $\frac{dy}{dx}$

Q3. Find $\frac{dy}{dx}$
 $y = x^{\log x} + (\log x^x)$

Q4. Differentiate $(\cos x)^{\sin x}$ with respect to $(\sin x)^{\cos x}$

Q5. Differentiate the functions given in Exercise:
 $(\log x)^x + x^{\log x}$

Q6. If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$, prove that $\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{1-x^2}$

Q7. If $\sqrt{y+x} + \sqrt{y-x} = c$, show that $\frac{dy}{dx} = \frac{y}{x} - \sqrt{\frac{y^2}{x^2} - 1}$

Q8. If $x = a \sin t - b \cos t$, $y = a \cos t + b \sin t$, Prove that $\frac{d^2y}{dx^2} = -\frac{x^2+y^2}{y^2}$

Q9. Differentiate the following functions with respect to x:
 $x^{(\sin x - \cos x)} + \frac{x^2-1}{x^2+1}$

Q10. If $y = x^n \{a \cos(\log x) + b \sin(\log x)\}$, prove that $x^2 \frac{d^2y}{dx^2} + (1-2n) \frac{dy}{dx} + (1+n^2)y = 0$.

Q11. Find $\frac{dy}{dx}$ in the following cases:
 $\sin xy + \cos(x+y) = 1$

Q12. Find $\frac{dy}{dx}$
 $y = (\tan x)^{\cot x} + (\cot x)^{\tan x}$

Q13. If $y^x + x^y + x^x = a^b$, find $\frac{dy}{dx}$

6 Marks

Q14. If $y^x = e^{x-e}$, prove that $\frac{dy}{dx} = \frac{(1+\log y)^2}{\log y}$

6 Marks

Q15. Find $\frac{dy}{dx}$
 $y = \frac{(x^2-1)^3(2x-1)}{\sqrt{(x-3)(4x-1)}}$

6 Marks

Q16. If $x = a(\cos t + \log \tan \frac{t}{2})$ and $y = a(\sin t)$, evaluate $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{3}$.

6 Marks

Q17.

6 Marks

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If $y = e^{a \cos^{-1} x}$, $-1 \leq x \leq 1$, show that $(1 - x^2) \frac{d^2 y}{dx^2} - x \frac{dy}{dx} - a^2 y = 0$.

Q18. Differentiate the following functions with respect to x :

6 Marks

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

Q19. Differentiate the following functions with respect to x :

5 Marks

$$\sin^2 \{\log(2x + 3)\}$$

Q20. If $x^{16}y^9 = (x + y)^{17}$, prove that $x \frac{dy}{dx} = 2y$

5 Marks

Q21. If $x = a(\cos \theta + \theta \sin \theta)$, $y = a(\sin \theta - \theta \cos \theta)$ prove that $\frac{d^2 x}{d\theta^2} = a(\cos \theta - \theta \sin \theta)$, $\frac{d^2 y}{d\theta^2} = a(\sin \theta - \theta \cos \theta)$ and $\frac{d^2 y}{dx^2} = \frac{\sec^3 \theta}{a\theta}$

5 Marks

Q22. If $x^x + y^y = 1$, prove that $\frac{dy}{dx} = -\frac{y(y+x \log y)}{x(y \log x + x)}$

Q23. If $(\sin x)^y = x + y$, prove that $\frac{dy}{dx} = \frac{1 - (x+y)y \cot x}{(x+y) \log \sin x - 1}$

Q24. Find $\frac{dy}{dx}$
 $y = (\sin x)^x + \sin^{-1} \sqrt{x}$

Q25. 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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