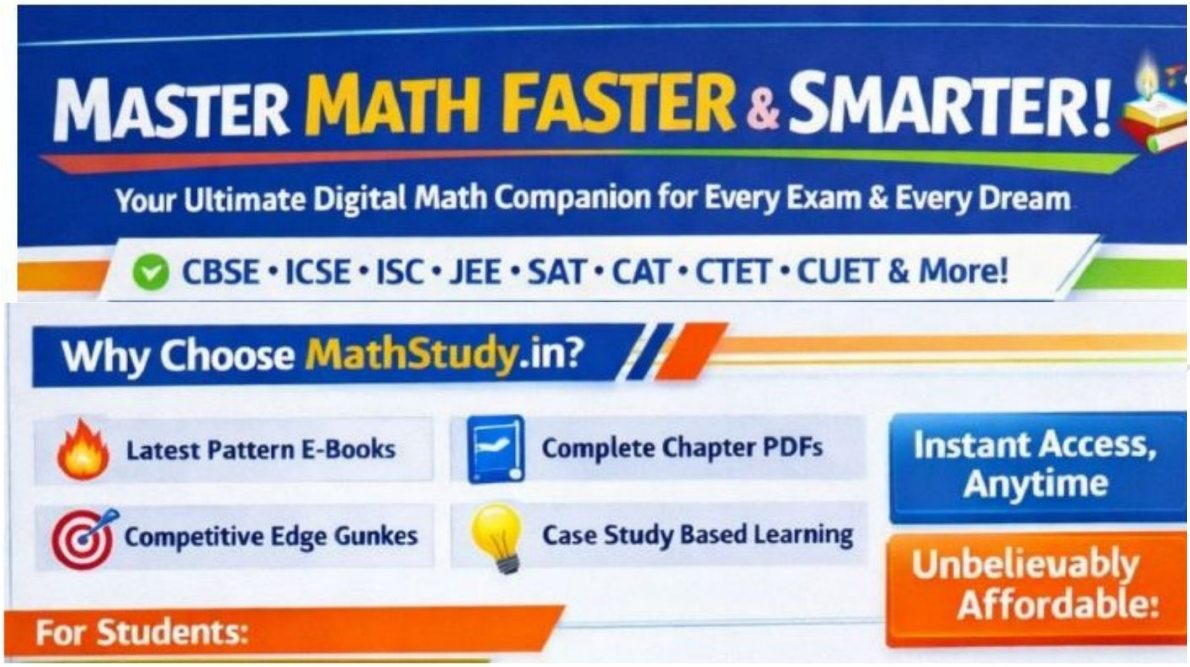
SOLUTIONS

www.udgamwelfarefoundation.com

For Best Mathematics E-Books, Visit:
www.mathstudy.in



Special Features

- **Board-Specific** – CBSE, ICSE, ISC, State Boards
- **Exam-Focused** – JEE, SAT, CAT, CTET, CUET, NTSE
- **Grade-Wise** – Class 6 to 12
- **Bilingual Options** – English & Hindi Medium Support
- **Printable & Shareable** – Use offline, anytime

How to Order:

Visit : https://www.mathstudy.in
Browse by Exam, Class, or Topic
Add to Cart & Checkout

Contact & Support:

Email: admin@mathstudy.in
WhatsApp Support Available : +91-+91 92118 65759

Why Wait? Empower your learning journey, save time, and achieve your dreams!

Explore & Start Learning Today:
https://www.mathstudy.in – Premium eBooks for success
https://www.udgamwelfarefoundation.com – Free PDFs, practice tests, & guida

MathStudy.in — Empowering Learners, Enabling Educators, Encouraging Excellence.
Digital Learning | Affordable Excellence | Trusted by Thousands

CUET Mathematics Test

Chapter: Calculus (Derivatives and Applications)

Solutions

1. **Correct Option: (A)**. $y' = \frac{1}{x \log x}$. $y'' = -\frac{1}{(x \log x)^2} \frac{d}{dx}(x \log x) = -\frac{1+\log x}{(x \log x)^2}$.

2. **Correct Option: (B)**. For $y = x^x$, $y' = x^x(1 + \log x)$. $y' = 0 \Rightarrow 1 + \log x = 0 \Rightarrow \log x = -1 \Rightarrow x = 1/e$.

3. **Correct Option: (A)**. Standard substitution and differentiating twice leads to the differential equation $(1 - x^2)y_2 - xy_1 = a^2 y$.

4. **Correct Option: (C)**. $f'(x) = 2xe^{-x} - x^2e^{-x} = xe^{-x}(2 - x)$. For increasing, $f'(x) > 0$. Since $e^{-x} > 0$, $x(2 - x) > 0 \Rightarrow 0 < x < 2$.

5. **Correct Option: (B)**. Let $y = (1/x)^x \Rightarrow \log y = -x \log x$. Differentiating gives max at $x = 1/e$. Value: $(e)^{1/e}$.

6. **Correct Option: (B)**. $f'(x) = k - \cos x$. For increasing, $k - \cos x > 0 \Rightarrow k > \cos x$. Since max value of $\cos x$ is 1, $k > 1$.

7. **Correct Option: (A)**. $2yy' = 1 \Rightarrow y' = 1/(2y) = \tan(\pi/4) = 1$. Thus $y = 1/2$. Substituting in $y^2 = x$ gives $x = 1/4$.

8. **Correct Option: (B)**. $f'(x) = \sec^2 x$. $f''(x) = 2 \sec x(\sec x \tan x) = 2 \sec^2 x \tan x$. At $x = \pi/4$, $f''(\pi/4) = 2(\sqrt{2})^2(1) = 4$.

9. **Correct Option: (B)**. $f'(x) = 6x^2 - 6x - 12 = 6(x^2 - x - 2) = 6(x - 2)(x + 1)$. Critical points are 2, -1. $f''(x) = 12x - 6$. $f''(-1) = -18 < 0 \Rightarrow$ Local Max.

10. **Correct Option: (B)**. $A = \pi r^2 \Rightarrow dA/dt = 2\pi r(dr/dt) = 2\pi(10)(4) = 80\pi$.

11. **Correct Option: (B)**. $f'(x) = (1 - \log x)/x^2$. $f'(x) = 0 \Rightarrow \log x = 1 \Rightarrow x = e$.

12. **Correct Option: (B)**. Similar to question 3, standard differentiation of the composite trigonometric function results in $(1 - x^2)y'' - xy' = -m^2 y$.

13. **Correct Option: (A)**. $y = 6/x$. $f(x) = 2x + 18/x$. $f'(x) = 2 - 18/x^2 = 0 \Rightarrow x = 3$. $f(3) = 6 + 6 = 12$.

14. **Correct Option: (B)**. $f'(x) = -\sin x - 2p$. For decreasing, $-\sin x - 2p < 0 \Rightarrow 2p > -\sin x$. Max value of $-\sin x$ is 1, so $2p > 1 \Rightarrow p > 1/2$.

15. **Correct Option: (B)**. $f'(x) = 3x^2 - 12x + 9$. $f''(x) = 6x - 12$. Point of inflection where $f''(x) = 0 \Rightarrow x = 2$.