# CUET (UG) – MATHEMATICS

Chapter Test - Unit III: Calculus - Integrals

## SOLUTIONS

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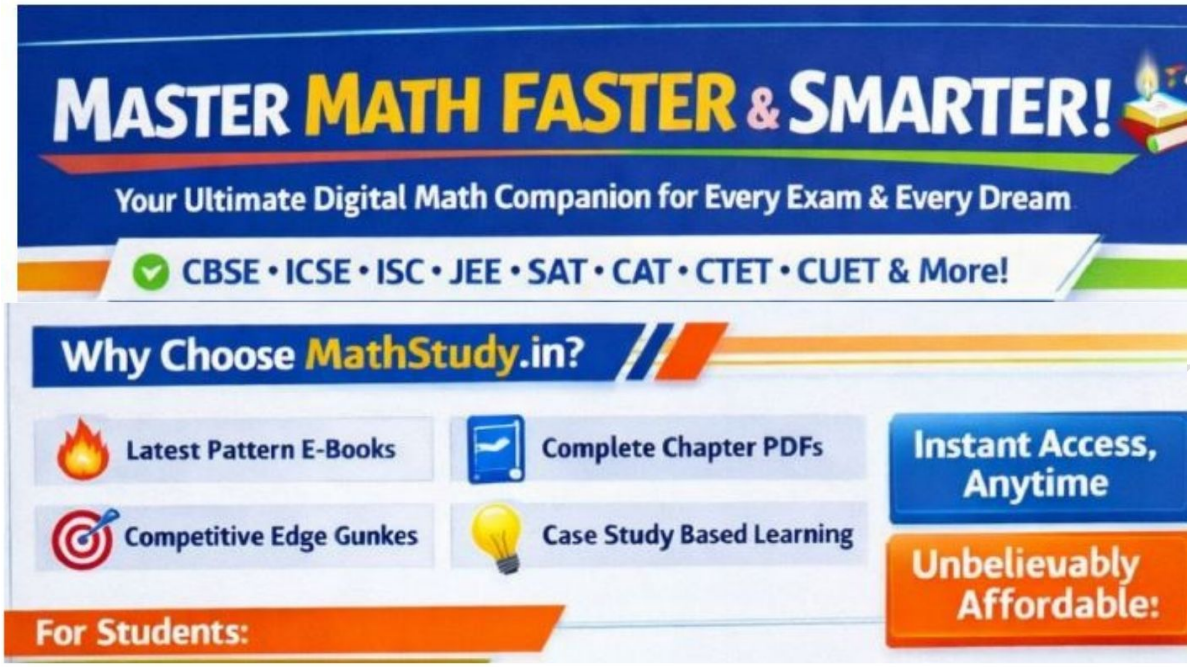


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## Solutions

1. **Correct Option: (A)**. Formula $\int \frac{dx}{x^2+a^2} = \frac{1}{a}\tan^{-1}\frac{x}{a} + C$. Here $a = 5$.
2. **Correct Option: (A)**. Let $x^3 = t \implies 3x^2dx = dt$. Integral becomes $\frac{1}{3}\int \frac{dt}{1+t^2} = \frac{1}{3}\tan^{-1}(x^3) + C$.
3. **Correct Option: (A)**. $\int \sec x \tan x dx = \sec x + C$.
4. **Correct Option: (A)**. Form $\int e^x[f(x) + f'(x)]dx$ where $f(x) = x^2$.
5. **Correct Option: (A)**. $\int \frac{dx}{\sqrt{4^2-(3x)^2}}$. Let $3x = t \implies 3dx = dt$. Result: $\frac{1}{3}\sin^{-1}(\frac{3x}{4}) + C$.
6. **Correct Option: (A)**. $\int \frac{x+1+1}{x+1}dx = \int(1 + \frac{1}{x+1})dx = x + \log|x+1| + C$.
7. **Correct Option: (B)**. Let $\log x = t \implies \frac{1}{x}dx = dt$. $\int \frac{dt}{t} = \log|t| = \log|\log x| + C$.
8. **Correct Option: (A)**. $x^2 + 2x + 5 = (x+1)^2 + 4$. Matches standard log form with $x + 1$.
9. **Correct Option: (A)**. By parts: $x(\frac{e^{2x}}{2}) - \int \frac{e^{2x}}{2}dx = \frac{xe^{2x}}{2} - \frac{e^{2x}}{4} + C$.
10. **Correct Option: (A)**. Let $\tan^{-1} x = t \implies \frac{1}{1+x^2}dx = dt$. $\int \sin t dt = -\cos t = -\cos(\tan^{-1} x) + C$.
11. **Correct Option: (A)**. Formula $\int \frac{dx}{x^2-a^2} = \frac{1}{2a}\log|\frac{x-a}{x+a}|$. Here $2a = 10$.
12. **Correct Option: (A)**. $\int(\sec^2 x - 1)dx = \tan x - x + C$.
13. **Correct Option: (A)**. Multiply by $x^4$: $\int \frac{x^4}{x^5(x^5+1)}dx$. Let $x^5 = t \implies 5x^4dx = dt$. $\frac{1}{5}\int \frac{dt}{t(t+1)} = \frac{1}{5}\log|\frac{t}{t+1}|$.
14. **Correct Option: (A)**. Form $\int e^x[f(x) + f'(x)]dx$ where $f(x) = 1/x$.
15. **Correct Option: (A)**. Substituting $e^x = \sin\theta$ allows the square root to simplify via $1 - \sin^2\theta = \cos^2\theta$.
16. **Correct Option: (A)**. Let $x^2 = t \implies 2xdx = dt$. $\int \frac{dt}{(t+1)(t+3)} = \frac{1}{2}\int(\frac{1}{t+1} - \frac{1}{t+3})dt$.
17. **Correct Option: (D)**. You use partial fractions, but treating $x^2$ as a single variable $t$ makes the partial fraction decomposition much faster.
18. **Correct Option: (A)**. This is the standard formula for the integral of $\sqrt{a^2 - x^2}$.
19. **Correct Option: (A)**. $1 + \cos x = 2\cos^2(x/2)$. $\int \frac{1}{2}\sec^2(x/2)dx = \tan(x/2) + C$.
20. **Correct Option: (A)**. Standard form $\int \frac{dx}{\sqrt{x^2+a^2}} = \log|x + \sqrt{x^2 + a^2}| + C$.