CUET Mathematics Test - Set 5

Chapter: Integration and its Applications

SOLUTIONS

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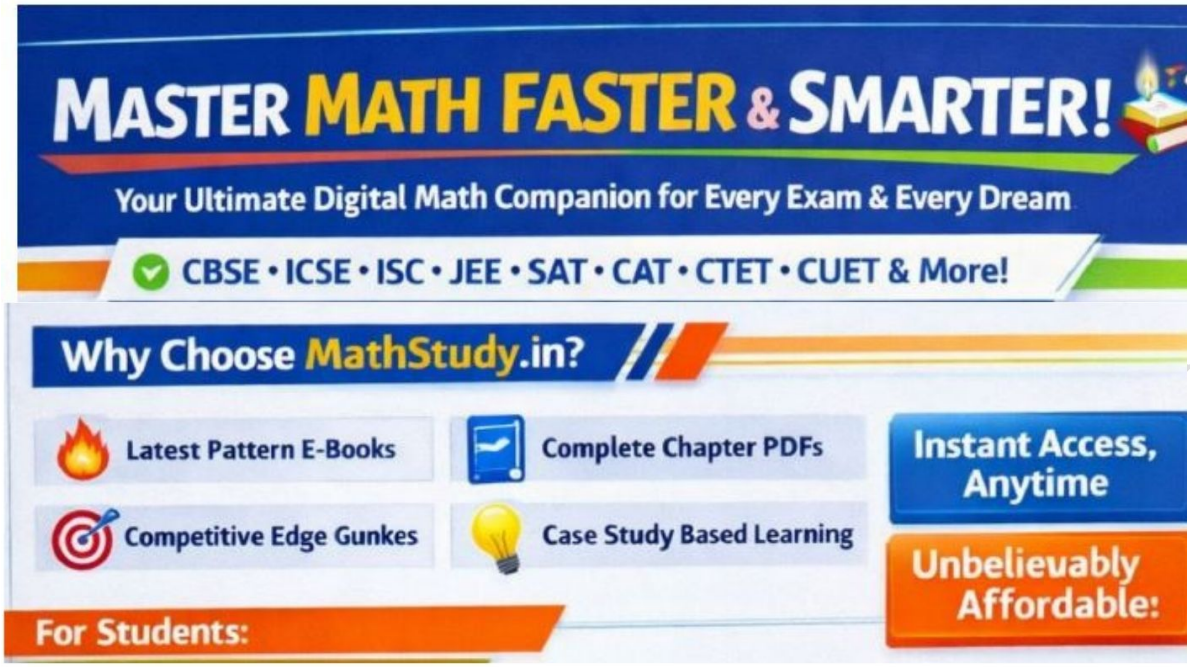

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Solutions

1. **Correct Option: (B)**. $\int \frac{dx}{\sqrt{x}(1+\sqrt{x})}$. Let $1+\sqrt{x}=t \Rightarrow \frac{1}{2\sqrt{x}}dx = dt$. Integral becomes $2\int \frac{1}{t}dt = 2\log|t| + C$.

2. **Correct Option: (A)**. $\int e^x(\frac{1}{x} - \frac{1}{x^2})dx$. This is of the form $\int e^x[f(x)+f'(x)]dx = e^x f(x)$. Here $f(x) = 1/x$.

3. **Correct Option: (B)**. $x^2+2x-3 = (x+3)(x-1)$. The expression is negative in $[0,1]$ and positive in $[1,2]$. $\int_0^1 -(x^2+2x-3)dx + \int_1^2 (x^2+2x-3)dx = [-(x^3/3+x^2-3x)]_0^1 + [x^3/3+x^2-3x]_1^2 = 5/3+7/3 = 4$.

4. **Correct Option: (A)**. $\int_0^\pi \sin x dx = [-\cos x]_0^\pi = -(-1)-(-1) = 2$.

5. **Correct Option: (A)**. $\int(\frac{\sin^2 x}{\sin^2 x\cos^2 x} - \frac{\cos^2 x}{\sin^2 x\cos^2 x})dx = \int(\sec^2 x - \operatorname{cosec}^2 x)dx = \tan x + \cot x + C$.

6. **Correct Option: (C)**. Let $I = \int_0^{\pi/2}\log(\tan x)dx$. Using $x \to \pi/2 - x$, $I = \int_0^{\pi/2}\log(\cot x)dx = \int_0^{\pi/2}\log(1/\tan x)dx = -I$. Thus $2I = 0 \Rightarrow I = 0$.

7. **Correct Option: (A)**. $\int_1^4 \sqrt{x}dx = [\frac{2}{3}x^{3/2}]_1^4 = \frac{2}{3}(8-1) = 14/3$.

8. **Correct Option: (A)**. Partial fractions: $\frac{3x+4}{(x-2)(x+1)} = \frac{A}{x-2} + \frac{B}{x+1}$. $3x+4 = A(x+1)+B(x-2)$. Putting $x=2 \Rightarrow 10 = 3A \Rightarrow A = 10/3$. Putting $x=-1 \Rightarrow 1 = -3B \Rightarrow B = -1/3$.

9. **Correct Option: (A)**. $\int \frac{e^x}{e^{2x}+1}dx$. Let $e^x = t, e^x dx = dt$. Limits 1 to e. $\int_1^e \frac{dt}{t^2+1} = [\tan^- 1t]_1^e = \tan^{-1} e - \pi/4$.

10. **Correct Option: (C)**. Area of circle is πr^2. $r^2 = 16 \Rightarrow \pi(16) = 16\pi$.

11. **Correct Option: (A)**. Let $\log(\log x) = t \Rightarrow \frac{1}{\log x}\cdot\frac{1}{x}dx = dt$. Integral is $\int \frac{1}{t}dt = \log|t| + C$.

12. **Correct Option: (D)**. Both $\sin^7 x$ and $x^3\cos x$ are odd functions. $\int_{-a}^a f(x)dx = 0$ if $f(x)$ is odd.

13. **Correct Option: (A)**. Area $= \int_0^{\pi/2}\cos x dx + |\int_{\pi/2}^\pi \cos x dx| = [\sin x]_0^{\pi/2} + |[\sin x]_{\pi/2}^\pi| = 1 + |0-1| = 2$.

14. **Correct Option: (A)**. $\int e^x[\frac{(x+4)-1}{(x+4)^2}]dx = \int e^x[\frac{1}{x+4} - \frac{1}{(x+4)^2}]dx$. Form $e^x(f+f')$.

15. **Correct Option: (B)**. Roots are $x = 0, 2$. Area $= \int_0^2(2x-x^2)dx = [x^2 - x^3/3]_0^2 = 4 - 8/3 = 4/3$.