

Integral Calculus Question Bank

2nd Semester Diploma Engineering for All Branch

✓ Basic integration:



Exercise 1.

Q.1. Evaluate $\int (x + 1)^2 dx$

Q.2. Evaluate $\int x(x - 1)^2 dx$

Q.3. Evaluate $\int x(1 + x) dx$

Q.4. Evaluate $\int \frac{1}{\sqrt[4]{(2-3x)^3}} dx$

Q.5. Evaluate $\int \left(\frac{1}{1+x^2} + 5^x \right) dx$

Q.6. Evaluate $\int \left(\frac{1}{\sqrt{1-x^2}} - \cos x \right) dx$

Q.7. Evaluate $\int \left(\frac{1}{\sqrt{9-4x^2}} \right) dx$

Q.8. Evaluate $\int e^{\log_e x} dx$

Q.9. Evaluate $\int \left[\frac{1}{1+x^2} - \frac{\cos x}{\sin^2 x} \right] dx$

Q.10. Evaluate $\int (x^a + a^x + a^a) dx$

Q.11. Evaluate $\int (e^x + x^e + e^e) dx$

Q.12. Evaluate $\int \frac{(1+\sqrt{x})^2}{\sqrt{x}} dx$

Q.13. Evaluate $\int \frac{(x^2+1)^2}{x} dx$

Q.14. Evaluate $\int \frac{2x^3+5x^2+4}{\sqrt{x}} dx$

✓ Integration of composite function:



Exercise 2.

Q.1. Evaluate $\int e^{2x} dx$

Q.2. Evaluate $\int (\sin(\cos x) - x + 15) dx$

✓ Integration of Trigonometric transformation:



Q.1. Evaluate $\int \frac{\sin x}{\cos^2 x} dx$

Q.2. Evaluate $\int \sin^{-1}(\cos x) dx$

Q.3. Evaluate $\int \frac{1}{1+\cos 2x} dx$

Q.4. Evaluate $\int \frac{1}{1-\cos 2x} dx$

Q.5. Evaluate $\int \sin^2 x dx$

Q.6. Evaluate $\int \sin^2 2x dx$

Q.7. Evaluate $\int \sin^2 \frac{x}{2} dx$

Q.8. Evaluate $\int \sin^3 x dx$

Q.9. Evaluate $\int \cos^3 x dx$

Q.10. Evaluate $\int \cos^2 x dx$

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Q.11. Evaluate $\int \sqrt{1 + \sin 2x} dx$

Q.12. Evaluate $\int \sqrt{1 + \cos 2x} dx$

Q.13. Evaluate $\int \frac{1}{\sin^2 x \cdot \cos^2 x} dx$

Q.14. Evaluate $\int \cos 5x \cdot \sin 3x dx$

Q.15. Evaluate $\int \cos 8x \cdot \cos 2x dx$

Q.16. Evaluate $\int (\tan x + \cot x)^2 dx$

✓ Method of Integration

- 1) Integration by Substitution
- 2) Integration by Partial Fraction
- 3) Integration by Parts

1) Integration By Substitution:



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If $\int f(x) \cdot f'(x) dx$ then put $f(x) = t$

Where, $f(x)$ is given function and $f'(x)$ is the derivative of $f(x)$

Exercise 4.

Q.1. Evaluate $\int \sin^4 x \cdot \cos x dx$

Q.2. Evaluate $\int \sin^3 x \cdot \cos x dx$

Q.3. Evaluate $\int e^{e^x} e^x dx$

Q.4. Evaluate $\int \cos^3 x \sin^2 x dx$

Q.5. Evaluate $\int \frac{1}{x \log x} dx$

Q.6. Evaluate $\int \frac{1}{x + \sqrt{x}} dx$

Q.7. Evaluate $\int \frac{1}{x \cos^2(\log x)} dx$

Q.8. Evaluate $\int \frac{\cos(\log x)}{x} dx$

Q.9. Evaluate $\int \frac{\log(\tan \frac{x}{2})}{\sin x} dx$

Q.10. Evaluate $\int \operatorname{cosec} x \left[\log \left(\tan \frac{x}{2} \right) \right] dx$

Q.11. Evaluate $\int \frac{dx}{x \sin^2(\log x)}$

Q.12. Evaluate $\int \frac{1}{x \log x [\log(\log x)]} dx$

Q.13. Evaluate $\int \sec^2(\log x) \frac{1}{x} dx$

Q.14. Evaluate $\int 3x \sqrt{x^2 + 4} dx$

Q.15. Evaluate $\int \frac{1 - \tan x}{1 + \tan x} dx$

Q.16. Evaluate $\int \frac{\sin \sqrt{x}}{\sqrt{x}} dx$

Q.17. Evaluate $\int \frac{\cos \sqrt{x}}{\sqrt{x}} dx$

Q.18. Evaluate $\int \tan^3 x dx$

Q.19. Evaluate $\int \tan^6 x dx$

Q.20. Evaluate $\int \frac{1}{\sin^{-1} x \sqrt{1-x^2}} dx$

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Q.21. Evaluate $\int \frac{1}{\sqrt{1-x^2}(\sin^{-1} x)^2} dx$

Q.22. Evaluate $\int \frac{(\tan^{-1} x)^3}{1+x^2} dx$

Q.23. Evaluate $\int \frac{e^x(x-1)}{x^2 \cos^2\left(\frac{e^x}{x}\right)} dx$

Q.24. Evaluate $\int \frac{e^x(x-1)}{x^2 \sin^2\left(\frac{e^x}{x}\right)} dx$

Q.25. Evaluate $\int \frac{e^x(x+1)}{\cos^2(xe^x)} dx$

Q.26. Evaluate $\int \frac{e^x}{e^{2x}-16} dx$

Q.27. Evaluate $\int \frac{1+\tan^2 x}{1-\tan^2 x} dx$

Q.28. Evaluate $\int \frac{\cos x - \sin x}{\cos x + \sin x} dx$

2) Integration by Partial Fraction:



Exercise 5:



Q.1. Evaluate $\int \frac{1}{x(x+1)} dx$

Q.2. Evaluate $\int \frac{1}{x^2+4x-5} dx$

Q.3. Evaluate $\int \frac{x}{x^2+3x-4} dx$

Q.4. Evaluate $\int \frac{1}{x^2+5x+6} dx$

Q.5. Evaluate $\int \frac{dx}{(x+1)(x+2)}$

Q.6. Evaluate $\int \frac{x}{(x+1)(x-2)} dx$

Q.7. Evaluate $\int \frac{(x+1)}{(x+2)(x+3)} dx$

Q.8. Evaluate $\int \frac{1}{(x+2)(x+3)} dx$

Q.9. Evaluate $\int \frac{1}{2x^2-5x+2} dx$

Q.10. Evaluate $\int \frac{2x+1}{(x+1)(2x-1)} dx$

Q.11. Evaluate $\int \frac{x+1}{x(x^2-4)} dx$

Q.12. Evaluate $\int \frac{1}{x^2+3x+2} dx$

Q.13. Evaluate $\int \frac{5x-4}{x^2-8x+12} dx$

Q.14. Evaluate $\int \frac{x^2+6x-8}{(x^3-4x)} dx$

Q.15. Evaluate $\int \frac{x^2+1}{(x+1)(x+2)(x-1)} dx$

Q.16. Evaluate $\int \frac{x-3}{x^3-3x^2-16x+48} dx$

Q.17. Evaluate $\int \frac{x}{(x^2+4)(x^2+9)} dx$

Q.18. Evaluate $\int \frac{x}{(x^2-1)(x^2+2)} dx$

Q.19. Evaluate $\int \frac{e^x}{(e^x-1)(e^x+1)} dx$

Q.20. Evaluate $\int \frac{\sin x}{(1+\cos x)(2+\cos x)} dx$

Q.21. Evaluate $\int \frac{\sec^2 x}{3\tan^2 x - 2\tan x - 5} dx$

Q.22. Evaluate $\int \frac{\cos x}{(2+\sin x)(3+\sin x)} dx$

Q.23. Evaluate $\int \frac{\sec^2 x}{(1+\tan x)(3+\tan x)} dx$

Q.24. Evaluate $\int \frac{\sec^2 x}{(1+\tan x)(2+\tan x)} dx$

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Q.25. Evaluate $\int \frac{1}{x(2+\log x)(3+\log x)} dx$

Q.26. Evaluate $\int \frac{\log x}{x(2+\log x)(3+\log x)} dx$

3) Integration By Parts:

$$\int u \cdot v dx = u \int v dx - \int \left[\int v dx \cdot \frac{d}{dx} u \right] dx$$



Used **LIATE** rule for selection of “u” and “v” function

Where,



L	=	Logarithmic Function	($\log x, \log(x + 1)$ etc.)
I	=	Inverse Trigonometric Function	($\sin^{-1} x, \tan^{-1} x$ etc)
A	=	Algebraic Function	($1, x, x^2, x^3$ etc)
T	=	Trigonometric Function	($\sin x, \cos x$ etc)
E	=	Exponential Function	(e^x, a^x etc)

Exercise 6:

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| <ol style="list-style-type: none"> 1. Evaluate $\int x e^x dx$ 2. Evaluate $\int x^2 e^x dx$ 3. Evaluate $\int x \sin x dx$ 4. Evaluate $\int \sec^2 x \cdot x dx$ 5. Evaluate $\int x \log x dx$ 6. Evaluate $\int \frac{x}{1+\cos 2x} dx$ 7. Evaluate $\int \log x dx$ 8. Evaluate $\int \tan^{-1} x dx$ 9. Evaluate $\int \cot^{-1} x dx$ 10. Evaluate $\int \sin^{-1} x dx$ | <ol style="list-style-type: none"> 11. Evaluate $\int \cos^{-1} x dx$ 12. Evaluate $\int \cos(\log x) dx$ 13. Evaluate $\int x \log(1 + x) dx$ 14. Evaluate $\int x^2 \tan^{-1} x dx$ 15. Evaluate $\int x \tan^{-1} x dx$ 16. Evaluate $\int x^2 \cos 2x dx$ 17. Evaluate $\int x^2 \sin 3x dx$ 18. Evaluate $\int \sin(\log x) dx$ 19. Evaluate $\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$ |
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