[09-10-18-F]

From: Thomas and Finney, 5th ed

Evaluate each of the integrals 1 through 44 by reducing the integrand to one of the standard forms. In each case, indicate what you have called u and refer by number to the standard formula used.

1. $\int \sqrt{2x+3}\,dx$
2. $\int \frac{dx}{3x+5}$
3. $\int \frac{dx}{(2x-7)^2}$
4. $\int \frac{(x+1)\,dx}{x^2+2x+3}$
5. $\int \frac{\sin x\,dx}{2+\cos x}$
6. $\int \tan^3 2x \sec^2 2x\,dx$
7. $\int \frac{x\,dx}{\sqrt{1-4x^2}}$
8. $\int x^{1/3}\sqrt{x^{4/3}-1}\,dx$
9. $\int \frac{2\,dx}{\sqrt{1-4x^2}}$
10. $\int \frac{2v\,dv}{\sqrt{1-v^4}}$
11. $\int \frac{x\,dx}{(3x^2+4)^3}$
12. $\int x^2\sqrt{x^3+5}\,dx$
13. $\int \frac{x^2\,dx}{\sqrt{x^3+5}}$
14. $\int \frac{x\,dx}{4x^2+1}$
15. $\int e^{2x}\,dx$
16. $\int e^{\cos x}\sin x\,dx$
17. $\int \frac{dx}{e^{3x}}$
18. $\int \frac{e^{\sqrt{x+1}}}{\sqrt{x+1}}dx$
19. $\int \frac{e^x\,dx}{1+e^{2x}}$
20. $\int \frac{dt}{1+9t^2}$
21. $\int \cos^2 x \sin x\,dx$
22. $\int \frac{\cos x\,dx}{\sin^3 x}$
23. $\int \cot^3 x \csc^2 x\,dx$
24. $\int \tan 3x \sec^2 3x\,dx$
25. $\int \frac{e^{2x}+e^{-2x}}{e^{2x}-e^{-2x}}dx$
26. $\int \sin 2x \cos^2 2x\,dx$
27. $\int (1+\cos\theta)^3 \sin\theta\,d\theta$
28. $\int te^{-t^2}\,dt$
29. $\int \frac{dt}{t\sqrt{4t^2-1}}$
30. $\int \frac{dx}{\sqrt{e^{2x}-1}}$ [*Hint.* Multiply numerator and denominator by e^x.]
31. $\int \frac{\cos x\,dx}{\sin x}$
32. $\int \frac{\cos x\,dx}{1+\sin x}$
33. $\int \sec^3 x \tan x\,dx$
34. $\int \frac{\sin\theta\,d\theta}{\sqrt{1+\cos\theta}}$
35. $\int e^{\tan 3x}\sec^2 3x\,dx$
36. $\int \cos 2t\sqrt{4-\sin 2t}\,dt$
37. $\int \frac{1+\cos 2x}{\sin^2 2x}dx$
38. $\int \frac{\sin^2 2x}{1+\cos 2x}dx$
39. $\int \frac{\csc^2 2t}{\sqrt{1+\cot 2t}}dt$
40. $\int e^{3x}\,dx$
41. $\int \frac{e^{\tan^{-1}2t}}{1+4t^2}dt$
42. $\int xe^{-x^2}\,dx$
43. $\int 3^x\,dx$
44. $\int 10^{2x}\,dx$

45. Can both of the following integrations be correct? Explain.

a) $\int \frac{dx}{\sqrt{1-x^2}} = \sin^{-1}x + C$

b) $\int \frac{dx}{\sqrt{1-x^2}} = -\int \frac{-dx}{\sqrt{1-x^2}} = \cos^{-1}(-x) + C$

46. Solve for C in each of the following equations.

a) $\tan^{-1}u + \cot^{-1}u = C$

b) $\sec^{-1}|u| + \csc^{-1}|u| = C$

47. Each of the integrals in (a) through (c) may be evaluated easily for a particular numerical value of n. Choose this value and integrate. For example,

$$\int x^n \cos(x^2)\,dx$$

is evaluated easily for $n = 1$:

$$\int x\cos(x^2)\,dx = \tfrac{1}{2}\sin(x^2) + C.$$

a) $\int x^n \ln x\,dx$, b) $\int x^n e^{x^3}\,dx$, c) $\int x^n \sin\sqrt{x}\,dx$.

CHAPTER 7

Article 7–1, pp. 335–336

1. $\frac{1}{3}(2x+3)^{3/2}+C$ **2.** $\frac{1}{3}\ln|3x+5|+C$ **3.** $-1/(4x-14)+C$ **4.** $\frac{1}{2}\ln|x^2+2x+3|+C$ **5.** $-\ln|2+\cos x|+C$
6. $\frac{1}{8}\tan^4 2x+C$ **7.** $-\frac{1}{4}\sqrt{1-4x^2}+C$ **8.** $\frac{1}{2}(x^{4/3}-1)^{3/2}+C$ **9.** $\sin^{-1}(2x)+C$ **10.** $\sin^{-1}(v^2)+C$
11. $-1/(12(3x^2+4)^2)+C$ **12.** $\frac{2}{9}(x^3+5)^{3/2}+C$ **13.** $\frac{2}{3}(x^3+5)^{1/2}+C$ **14.** $\frac{1}{8}\ln(4x^2+1)+C$ **15.** $\frac{1}{2}e^{2x}+C$
16. $-e^{\cos x}+C$ **17.** $-\frac{1}{3}e^{-3x}+C$ **18.** $2e^{\sqrt{x+1}}+C$ **19.** $\tan^{-1}(e^x)+C$ **20.** $\frac{1}{3}\tan^{-1}(3t)+C$ **21.** $-\frac{1}{3}\cos^3 x+C$
22. $-\frac{1}{2}\csc^2 x+C$ **23.** $-\frac{1}{4}\cot^4 x+C$ **24.** $\frac{1}{6}\tan^2 3x+C$ **25.** $\frac{1}{2}\ln|e^{2x}-e^{-2x}|+C$ **26.** $-\frac{1}{6}\cos^3 2x+C$
27. $-\frac{1}{4}(1+\cos\theta)^4+C$ **28.** $-\frac{1}{2}e^{-t^2}+C$ **29.** $\sec^{-1}|2t|+C$ **30.** $\sec^{-1}|e^x|+C$ **31.** $\ln|\sin x|+C$
32. $\ln|1+\sin x|+C$ **33.** $\frac{1}{3}\sec^3 x+C$ **34.** $-2\sqrt{1+\cos\theta}+C$ **35.** $\frac{1}{3}e^{\tan 3x}+C$ **36.** $-\frac{1}{3}(4-\sin 2t)^{3/2}+C$
37. $-\frac{1}{2}(\csc 2x+\cot 2x)+C$ **38.** $x-\frac{1}{2}\sin 2x+C$ **39.** $-\sqrt{1-\cot 2t}+C$ **40.** $\frac{1}{3}e^{3x}+C$ **41.** $\frac{1}{2}e^{\tan^{-1}2t}+C$
42. $-\frac{1}{2}e^{-x^2}+C$ **43.** $3^x/(\ln 3)+C$ **44.** $10^{2x}/(2\ln 10)+C$ **45.** Yes. Constants C differ; $\cos^{-1}(-x)=(\pi/2)+\sin^{-1}x$
46. a) $\pi/2$ **b)** $\pi/2$ **47. a)** -1; $\frac{1}{2}(\ln x)^2+C$ **b)** 2; $\frac{1}{3}e^{x^3}+C$ **c)** $-\frac{1}{2}$; $-2\cos\sqrt{x}+C$