The Weekly Rigor

No. 52 "A mathematician is a machine for turning coffee into theorems." June 20, 2015

51 Problems in Calculating Integrals Using *U*-Substitution with Solutions

(Part 3)

PROBLEMS

Type 1

1. $\int (x+1)^4\,dx$
2. $\int (x-50)^6\,dx$
3. $\int \sqrt{x+1}\,dx$
4. $\int \sqrt[6]{x-50}\,dx$
5. $\int \frac{1}{(x+2)^3}\,dx$
6. $\int \frac{1}{(x-21)^5}\,dx$
7. $\int \frac{1}{\sqrt{x+2}}\,dx$
8. $\int \frac{1}{\sqrt[5]{x-21}}\,dx$
9. $\int \frac{1}{x+3}\,dx$
10. $\int \frac{1}{x-3}\,dx$
11. $\int \cos(x+\pi)\,dx$
12. $\int \sin(x-5)\,dx$
13. $\int e^{x+3}\,dx$
14. $\int e^{31+x}\,dx$

Type 2

15. $\int (3x+1)^4\,dx$
16. $\int \left(\frac{1}{2}x-50\right)^6\,dx$
17. $\int \sqrt{3x+1}\,dx$
18. $\int \sqrt[6]{\frac{1}{2}x-50}\,dx$
19. $\int \frac{1}{(3x+2)^3}\,dx$
20. $\int \frac{1}{\left(\frac{3}{4}x-21\right)^5}\,dx$
21. $\int \frac{1}{\sqrt{3x+2}}\,dx$
22. $\int \frac{1}{\sqrt[5]{\frac{3}{7}x-21}}\,dx$
23. $\int \frac{1}{2x+3}\,dx$
24. $\int \frac{1}{\frac{2}{5}x-3}\,dx$
25. $\int \cos(4x)\,dx$
26. $\int \sec^2\left(\frac{1}{3}x\right)dx$
27. $\int e^{2x+3}\,dx$

Type 3

28. $\int (3x^2+1)^4 x\,dx$
29. $\int \left(\frac{1}{2}x^3-50\right)^6 x^2\,dx$
30. $\int x^2\sqrt[6]{\frac{1}{2}x^3-50}\,dx$
31. $\int \frac{x}{(3x^2+2)^3}\,dx$
32. $\int \frac{x}{\sqrt{3x^2+2}}\,dx$
33. $\int \frac{x^2}{\sqrt[5]{\frac{3}{7}x^3-21}}\,dx$
34. $\int \frac{x}{2x^2+3}\,dx$
35. $\int \frac{x^2}{\frac{2}{5}x^3-3}\,dx$
36. $\int x\cos(3x^2)\,dx$
37. $\int x^2\sin\left(\frac{2}{3}x^3-5\right)dx$
38. $\int \frac{x-2}{(x^2-4x+3)^3}\,dx$
39. $\int e^{x^2}x\,dx$
40. $\int (x^3+3x)^2(x^2+1)\,dx$
41. $\int \sin(x)\cos(x)\,dx$
42. $\int \cot(x)\,dx$

Type 4

43. $\int (x+3)(x-1)^4\,dx$
44. $\int x^5\sqrt[5]{1+x^2}\,dx$
45. $\int x\sqrt{x-1}\,dx$
46. $\int \frac{x}{\sqrt{1+2x}}\,dx$
47. $\int \frac{x}{\sqrt[4]{x+2}}\,dx$
48. $\int \frac{x+4}{2x+5}\,dx$
49. $\int \frac{x^2+4}{x+2}\,dx$
50. $\int (x^3+1)^4x^5\,dx$
51. $\int \frac{(3+\ln(x))^2(2-\ln(x))}{x}\,dx$