Math 1B
Disc #5

Strategies for integration (7.5)

Feb 5
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Evaluate the integrals to the point where you are confident you could evaluate them completely.

1. $\int \frac{\cos x}{1-\sin x}\,dx$
2. $\int_0^1 (3x+1)^{\sqrt{2}}\,dx$
3. $\int_1^4 \sqrt{y}\ln y\,dy$
4. $\int \frac{\sin^3 x}{\cos x}\,dx$
5. $\int \frac{t}{t^4+2}\,dt$
6. $\int_0^1 \frac{x}{(2x+1)^3}\,dx$
7. $\int_{-1}^1 \frac{e^{\arctan y}}{1+y^2}\,dy$
8. $\int t\sin t\cos t\,dt$
9. $\int_2^4 \frac{x+2}{x^2+3x-4}\,dx$
10. $\int \frac{\cos(1/x)}{x^3}\,dx$
11. $\int \frac{1}{x^3\sqrt{x^2-1}}\,dx$
12. $\int \frac{2x-3}{x^3+3x}\,dx$
13. $\int \sin^5 t\cos^4 t\,dt$
14. $\int \ln(1+x^2)\,dx$
15. $\int x\sec x\tan x\,dx$
16. $\int_0^{\sqrt{2}/2} \frac{x^2}{\sqrt{1-x^2}}\,dx$
17. $\int_0^{\pi} t\cos^2 t\,dt$
18. $\int_1^4 \frac{e^{\sqrt{t}}}{\sqrt{t}}\,dt$
19. $\int e^{x+e^x}\,dx$
20. $\int e^{\sqrt{z}}\,dx$
21. $\int \arctan\sqrt{x}\,dx$
22. $\int \frac{\ln x}{x\sqrt{1+(\ln x)^2}}\,dx$
23. $\int_0^1 \left(1+\sqrt{x}\right)^8 dx$
24. $\int (1+\tan x)^2\sec x\,dx$
25. $\int_0^1 \frac{1+12t}{1+3t}\,dt$
26. $\int_0^1 \frac{3x^2+1}{x^3+x^2+x+1}\,dx$
27. $\int \frac{dx}{1+e^x}$
28. $\int \sin\sqrt{at}\,dt$
29. $\int \ln\left(x+\sqrt{x^2-1}\right)dx$
30. $\int_{-1}^2 |e^x-1|\,dx$
31. $\int \sqrt{\frac{1+x}{1-x}}\,dx$
32. $\int_1^3 \frac{e^{3/x}}{x^2}\,dx$
33. $\int \sqrt{3-2x-x^2}\,dx$
34. $\int_{\pi/4}^{\pi/2} \frac{1+4\cot x}{4-\cot x}\,dx$
35. $\int_{-\pi/2}^{\pi/2} \frac{x}{1+\cos^2 x}\,dx$
36. $\int \frac{1+\sin x}{1+\cos x}\,dx$
37. $\int_0^{\pi/4} \tan^3\theta\sec^2\theta\,d\theta$
38. $\int_{\pi/6}^{\pi/3} \frac{\sin\theta\cot\theta}{\sec\theta}\,d\theta$
39. $\int \frac{\sec\theta\tan\theta}{\sec^2\theta-\sec\theta}\,d\theta$
40. $\int_0^{\pi} \sin 6x\cos 3x\,dx$
41. $\int \theta\tan^2\theta\,d\theta$
42. $\int \frac{\tan^{-1}x}{x^2}\,dx$
43. $\int \frac{\sqrt{x}}{1+x^3}\,dx$
44. $\int \sqrt{1+e^x}\,dx$
45. $\int x^5 e^{-x^3}dx$
46. $\int \frac{(x-1)e^x}{x^2}\,dx$
47. $\int x^3(x-1)^{-4}\,dx$
48. $\int_0^1 x\sqrt{2-\sqrt{1-x^2}}\,dx$
49. $\int \frac{1}{x\sqrt{4x+1}}\,dx$
50. $\int \frac{1}{x^2\sqrt{4x+1}}\,dx$
51. $\int \frac{1}{x\sqrt{4x^2+1}}\,dx$
52. $\int \frac{dx}{x(x^4+1)}$
53. $\int x^2\sinh mx\,dx$
54. $\int (x+\sin x)^2\,dx$
55. $\int \frac{dx}{x+x\sqrt{x}}$
56. $\int \frac{dx}{\sqrt{x}+x\sqrt{x}}$
57. $\int x\sqrt[3]{x+c}\,dx$
58. $\int \frac{x\ln x}{\sqrt{x^2-1}}\,dx$
59. $\int \frac{dx}{x^4-16}$
60. $\int \frac{dx}{x^2\sqrt{4x^2-1}}$
61. $\int \frac{d\theta}{1+\cos\theta}$
62. $\int \frac{d\theta}{1+\cos^2\theta}$
63. $\int \sqrt{x}\,e^{\sqrt{x}}\,dx$
64. $\int \frac{1}{\sqrt{\sqrt{x}+1}}\,dx$
65. $\int \frac{\sin 2x}{1+\cos^4 x}\,dx$
66. $\int_{\pi/4}^{\pi/3} \frac{\ln(\tan x)}{\sin x\cos x}\,dx$
67. $\int \frac{1}{\sqrt{x+1}+\sqrt{x}}\,dx$
68. $\int \frac{x^2}{x^6+3x^3+2}\,dx$
69. $\int_1^{\sqrt{3}} \frac{\sqrt{1+x^2}}{x^2}\,dx$
70. $\int \frac{1}{1+2e^x-e^{-x}}\,dx$
71. $\int \frac{e^{2x}}{1+e^x}\,dx$
72. $\int \frac{\ln(x+1)}{x^2}\,dx$
73. $\int \frac{x+\arcsin x}{\sqrt{1-x^2}}\,dx$
74. $\int \frac{4^x+10^x}{2^x}\,dx$
75. $\int \frac{dx}{x\ln x-x}$
76. $\int \frac{x^2}{\sqrt{x^2+1}}\,dx$
77. $\int \frac{xe^x}{\sqrt{1+e^x}}\,dx$
78. $\int \frac{1+\sin x}{1-\sin x}\,dx$
79. $\int x\sin^2 x\cos x\,dx$
80. $\int \frac{\sec x\cos 2x}{\sin x+\sec x}\,dx$
81. $\int \sqrt{1-\sin x}\,dx$
82. $\int \frac{\sin x\cos x}{\sin^4 x+\cos^4 x}\,dx$

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83. The functions $y = e^{x^2}$ and $y = x^2e^{x^2}$ don't have elementary antiderivatives, but $y = (2x^2+1)e^{x^2}$ does. Evaluate $\int (2x^2+1)e^{x^2}\,dx$.

84. We know that $F(x) = \int_0^x e^{t^2}\,dt$ is a continuous function by FTC1, though it is not an elementary function. The functions

$$\int \frac{e^x}{x}\,dx \quad \text{and} \quad \int \frac{1}{\ln x}\,dx$$

are not elementary either, but they can be expressed in terms of F. Evaluate the following integrals in terms of F.

(a) $\int_2^4 \frac{e^x}{x}\,dx$ (b) $\int_3^5 \frac{1}{\ln x}\,dx$