Written Exercise 8.2

11. $\int -\frac{3}{5}\,dx = -\frac{3}{5}x + C$

13. $\int 24x^5\,dx = 24\int x^5\,dx$

$= 24 \cdot \frac{x^6}{6} + C = 4x^6 + C$

15. $\int h^{\frac{1}{2}}\,dh = \frac{h^{\frac{3}{2}}}{\frac{3}{2}} + C = \frac{2}{3}h^{\frac{3}{2}} + C$

17. $\int x^{-7/8}\,dx = \frac{x^{\frac{1}{8}}}{\frac{1}{8}} + C = 8x^{\frac{1}{8}} + C$

19. $\int 2x^{-2/3}\,dx = 2\int x^{-2/3}\,dx = 2 \cdot \frac{x^{\frac{1}{3}}}{\frac{1}{3}} + C = 6x^{\frac{1}{3}} + C$

21. $\int \sqrt[6]{x^5}\,dx = \int x^{\frac{5}{6}}\,dx = \frac{6}{11}x^{\frac{11}{6}} + C$

23. $\int (x-3)(x+2)\,dx = \int (x^2 - x - 6)\,dx = \frac{x^3}{3} - \frac{x^2}{2} - 6x + C$

25. $\int (3a+2)^2\,da = \frac{1}{3}(3a+2)^3 + C$

27. $\int \frac{6}{x^3}\,dx = \int 6x^{-3}\,dx = -3x^{-2} + C$

29. $\int \sqrt[3]{x}\,(x-1)^2\,dx = \int x^{\frac{1}{3}}(x^2-2x+1)\,dx$

$= \int x^{\frac{7}{3}} - 2x^{\frac{4}{3}} + x^{\frac{1}{3}} = \frac{3}{10}x^{\frac{10}{3}} - \frac{6x}{7}^{\frac{7}{3}} + \frac{3}{4}x^{\frac{4}{3}} + C$

31. $\int \frac{2x^2-4}{x^3}\,dx = \int (2x^{-1} - 4x^{-3})\,dx$

$= 2\ln|x| + 2x^{-2} + C$

33. $\int \cos 8u\,du = \frac{1}{8}\sin 8u + C$

35. $\int 12\cos\frac{1}{4}x\,dx = 12\int \cos\frac{1}{4}x\,dx$

$= 12 \cdot 4\sin\frac{1}{4}x + C = 48\sin\frac{1}{4}x + C$

37. $\int 2e^{\frac{1}{6}x}\,dx = 2\int e^{\frac{1}{6}x}\,dx = 2 \cdot 6e^{\frac{1}{6}x} + C$

$= 12e^{\frac{1}{6}x} + C$

39. $\int dx = \int 1\,dx = x + C$

41. $\int \frac{x}{e}\,dx = \frac{1}{e}\int x\,dx = \frac{1}{e}\cdot\frac{x^2}{2}+c = \frac{1}{2e}x^2+c$

43. $\int x^3\,dx = \frac{1}{4}x^4+c$

45. $\int \frac{3}{x}\,dx = \int 3x^{-1}\,dx = 3\ln|x|+c$

Written Exercise 8.3

7. $\int e^{6x}\,dx$ let $u = 6x$

$du = 6\,dx$

$\frac{1}{6}du = dx$

$$\int e^{u}\tfrac{1}{6}du = \tfrac{1}{6}\int e^{u}du = \tfrac{1}{6}e^{u} + C$$

$$= \tfrac{1}{6}e^{6x} + C$$

9. $\int \frac{1}{3x+8}\,dx$ let $u = 3x+8$

$du = 3x\,dx$

$\frac{1}{3}du = dx$

$$\int \tfrac{1}{u}\cdot\tfrac{1}{3}du = \tfrac{1}{3}\int \tfrac{1}{u}du = \tfrac{1}{3}\ln|u| + C$$

$$= \tfrac{1}{3}\ln|3x+8| + C$$

11. $\int x(x^2-6)^{11}dx$ let $u = x^2-6$

$\int (x^2-6)^{11}x\,dx$ $du = 2x\,dx$

$\frac{1}{2}du = x\,dx$

$$\int u^{11}\cdot\tfrac{1}{2}du = \tfrac{1}{2}\int u^{11}du = \tfrac{1}{2}\cdot\tfrac{1}{12}u^{12} + C$$

$$= \tfrac{1}{24}(x^2-6)^{12} + C$$

13. n/a

15. $\int \frac{\sin\sqrt{x}}{\sqrt{x}}\,dx = \int \sin\sqrt{x}\cdot x^{-1/2}\,dx$

let $u = \sqrt{x}$

$du = \frac{1}{2}x^{-1/2}\,dx$

$2du = x^{-1/2}\,dx$

$$\begin{aligned} &\int \sin u \cdot 2du \\ &= 2\int \sin u\,du \\ &= 2(-\cos u) + C \\ &= -2\cos\sqrt{x} + C \end{aligned}$$

17. $\int \frac{5}{(x-2)^3}\,dx = \int 5(x-2)^{-3}\,dx$ let $u = x-2$

$du = 1\,dx$

$5\int u^{-3}\,du = 5\cdot \frac{u^{-2}}{-2} + C = -\frac{5}{2}(x-2)^{-2} + C$

19. $\int \frac{x}{x^2-4}\,dx = \int (x^2-4)^{-1}x\,dx$ let $u = x^2-4$

$du = 2x\,dx$

$\frac{1}{2}du = x\,dx$

$\int u^{-1}\frac{1}{2}du = \frac{1}{2}\int \frac{1}{u}\,du = \frac{1}{2}\ln|u| + C$

$= \frac{1}{2}\ln|x^2-4| + C$

21. $\int \sin\theta\, e^{\cos\theta}\,d\theta$ let $u = \cos\theta$

$\int e^{\cos\theta}\sin\theta\,d\theta$ $du = -\sin\theta\,d\theta$

$-du = \sin\theta\,d\theta$

$-\int e^{u}\,du = -e^{u} + C = -e^{\cos\theta} + C$

23. $\int (3x+7)^{4.2} dx$ let $u = 3x+7$

$du = 3dx$

$\frac{1}{3}du = dx$

$$\int u^{4.2} \cdot \frac{1}{3}du = \frac{1}{3}\int u^{4.2}du = \frac{1}{3} \cdot \frac{u^{5.2}}{5.2} + C$$

$$= \frac{1}{15.6}(3x+7)^{5.2} + C = \frac{10}{156}(3x+7)^{5.2} + C$$

$$= \frac{5}{78}(3x+7)^{5.2} + C$$

25. $\int \sin \frac{1}{2}x \, dx$ let $u = \frac{1}{2}x$

$du = \frac{1}{2}dx$

$2du = dx$

$$\int \sin u \cdot 2du = 2\int \sin u \, du = 2(-\cos u) + C$$

$$= -2\cos \frac{1}{2}x + C$$

27. $\int \frac{x}{(x^2-1)^{11}} dx = \int (x^2-1)^{-11} x \, dx$ let $u = x^2-1$

$du = 2x\,dx$

$\frac{1}{2}du = x\,dx$

$$\int u^{-11} \cdot \frac{1}{2}du = \frac{1}{2}\int u^{-11}du = \frac{1}{2} \cdot \frac{u^{-10}}{-10} + C$$

$$= -\frac{1}{20}u^{-10} + C$$

$$= -\frac{1}{20}(x^2-1)^{-10} + C$$

29. $\int (\sin 2t)^3 \cos 2t \, dt$ let $u = \sin 2t$

$du = 2\cos 2t \, dt$

$\frac{1}{2} du = \cos 2t \, dt$

$\int u^3 \cdot \frac{1}{2} du = \frac{1}{2} \int u^3 du = \frac{1}{2} \frac{u^4}{4} + c$

$= \frac{1}{8} u^4 + c = \frac{1}{8} (\sin 2t)^4 + c$

31. $\int x^2 \sqrt[4]{x^3+4} \, dx = \int (x^3+4)^{\frac{1}{4}} x^2 dx$ let $u = x^3+4$

$du = 3x^2 dx$

$\frac{1}{3} du = x^2 dx$

$= \int u^{\frac{1}{4}} \cdot \frac{1}{3} du = \frac{1}{3} \int u^{\frac{1}{4}} du = \frac{1}{3} \cdot \frac{4}{5} u^{\frac{5}{4}} + c$

$= \frac{4}{15} u^{\frac{5}{4}} + c = \frac{4}{15} (x^3+4)^{\frac{5}{4}} + c$

33. $\int e^x (e^x+1)^4 dx = \int (e^x+1)^4 e^x dx$ let $u = e^x+1$

$du = e^x dx$

$\int u^4 du = \frac{1}{5} u^5 + c = \frac{1}{5} (e^x+1)^5 + c$

35. $\int \cos^6 x \sin x \, dx = \int (\cos x)^6 \sin x \, dx$ let $u = \cos x$

$du = -\sin x \, dx$

$-du = \sin x \, dx$

$-\int u^6 du = -\frac{1}{7} u^7 + c$

$= -\frac{1}{7} \cos^7 x + c$

37. $\int e^{4x}\cos(e^{4x})\,dx$ let $u=e^{4x}$

$du = 4e^{4x}dx$

$\frac{1}{4}du = e^{4x}dx$

$\int \cos u \cdot \frac{1}{4}du = \frac{1}{4}\int \cos u\,du$

$= \frac{1}{4}\sin u + C = \frac{1}{4}\sin(e^{4x}) + C$

39. $\int x^3 \sin x^4 (\cos^5 x^4)\,dx = \int (\cos x^4)^5 x^3 \sin x^4\,dx$

let $u = \cos x^4$

$du = -\sin x^4 \cdot 4x^3$

$-\frac{1}{4}du = x^3 \sin x^4$

$\int u^5\left(-\frac{1}{4}du\right) = -\frac{1}{4}\int u^5 du$

$= -\frac{1}{4}\frac{u^6}{6} + C = \frac{-1}{24}(\cos x^4)^6 + C$

$= \frac{-1}{24}\cos^6 x^4 + C$

41. $\int e^{-\sin x}\cos x\,dx$ let $u = -\sin x$

$du = -\cos x\,dx$

$-du = \cos x\,dx$

$-\int e^u du = -e^u + C = -e^{-\sin x} + C$

43. $\int \frac{\sqrt{\ln x}}{x}dx = \int (\ln x)^{1/2}\cdot\frac{1}{x}dx$ let $u = \ln x$

$du = \frac{1}{x}dx$

$\int u^{\frac{1}{2}}du = \frac{2}{3}u^{\frac{3}{2}} + C = \frac{2}{3}(\ln x)^{3/2} + C$

45. $\int \frac{\cos x}{\sin x}\,dx = \int (\sin x)^{-1}\cos x\,dx$ let $u=\sin x$, $du = \cos x\,dx$

$\int u^{-1}\,du = \int \frac{1}{u}\,du = \ln|u| + C$

$= \ln|\sin x| + C$

47. $\int \frac{x}{(x^2+1)^{5/2}}\,dx = \int (x^2+1)^{-5/2}\,x\,dx$ let $u = x^2+1$, $du = 2x\,dx$, $\frac{1}{2}du = x\,dx$

$\int u^{-5/2}\cdot\frac{1}{2}du = \frac{1}{2}\int u^{-5/2}\,du = \frac{1}{2}\cdot\frac{-2}{3}u^{-\frac{3}{2}} + C$

$= -\frac{1}{3}u^{-3/2} + C = -\frac{1}{3}(x^2+1)^{-3/2} + C$

49. $\int (x^3-5)e^{x^4-20x}\,dx = \int e^{x^4-20x}(x^3-5)\,dx$

let $u = x^4-20x$

$du = (4x^3-20)\,dx$

$\frac{1}{4}du = (x^3-5)\,dx$

$\frac{1}{4}\int e^u\,du = \frac{1}{4}e^u + C$

$= \frac{1}{4}e^{x^4-20x} + C$

51. $\int (1+\sin x)^4\cos x\,dx$ let $u = 1+\sin x$, $du = \cos x\,dx$

$\int u^4\,du = \frac{1}{5}u^5 + C = \frac{1}{5}(1+\sin x)^5 + C$

53. $\int \frac{\cos x}{1+\sin x}\,dx = \int (1+\sin x)^{-1}\cos x\,dx$ let $u = 1+\sin x$, $du = \cos x\,dx$

$\int u^{-1}\,du = \ln|u| + C = \ln|1+\sin x| + C$

Written Exercise 8.4

1. $\int_2^5 10\,dx = 10x\Big|_2^5 = 10(5) - 10(2) = 50 - 20 = 30$

3. $\int_2^6 x^2\,dx = \frac{1}{3}x^3\Big|_2^6 = \frac{1}{3}\left[(6)^3 - (2)^3\right] = \frac{1}{3}(216 - 8) = \frac{208}{3}$

5. $\int_{-5}^{-1} (t^2 + 4t - 5)\,dt = \frac{1}{3}t^3 + 2t^2 - 5t\Big|_{-5}^{-1}$

$= \frac{1}{3}(-1)^3 + 2(-1)^2 - 5(-1) - \left[\frac{1}{3}(-5)^3 + 2(-5)^2 - 5(-5)\right]$

$= -\frac{80}{3}$

7. $\int_{-4}^{-2} \frac{1}{x^2}\,dx = \int_{-4}^{-2} x^{-2}\,dx = -1x^{-1} = -\frac{1}{x}\Big|_{-4}^{-2}$

$= -\left(\frac{1}{-2}\right) - \left(-\frac{1}{-4}\right) = \frac{1}{2} - \frac{1}{4} = \frac{1}{4}$

9. $\int_1^4 \sqrt{b}(b-2)\,db = \int_1^4 b^{3/2} - 2b^{1/2} = \frac{2}{5}b^{\frac{5}{2}} - \frac{4}{3}b^{\frac{3}{2}}\Big|_1^4$

$= \frac{2}{5}(\sqrt{4})^5 - \frac{4}{3}(\sqrt{4})^3 - \left[\frac{2}{5}(\sqrt{1})^5 - \frac{4}{3}(\sqrt{1})^3\right]$

$= \left(\frac{64}{5} - \frac{32}{3}\right) - \left(\frac{2}{5} - \frac{4}{3}\right) = \frac{46}{15}$

11. $\int_0^{3\pi/4} \sin x \, dx = -\cos x \Big|_0^{3\pi/4}$

$= -\cos \frac{3\pi}{4} - (-\cos 0)$

$\frac{\sqrt{2}}{2} + 1$

13. $\int_{\ln 2}^{\ln 6} e^x \, dx = e^x \Big|_{\ln 2}^{\ln 6} = e^{\ln 6} - e^{\ln 2}$

$6 - 2 = 4$

15 $\int_{\pi/8}^{\pi/4} \sin 4x \, dx = -\frac{1}{4} \cos 4x \Big|_{\frac{\pi}{8}}^{\frac{\pi}{4}}$

$-\frac{1}{4}\left[\cos\left(4 \cdot \frac{\pi}{4}\right) - \cos\left(4 \cdot \frac{\pi}{8}\right)\right] = -\frac{1}{4}\left[\cos \pi - \cos \frac{\pi}{2}\right]$

$= -\frac{1}{4}\left[-1 - 0\right] = \frac{1}{4}$

17. $\int_e^{e^3} \frac{1}{x} \, dx = \ln|x| \Big|_e^{e^3} = \ln e^3 - \ln e$

$3 - 1$

2

19. $\int_4^9 \frac{x^2 - x}{\sqrt{x}} \, dx = \int_4^9 x^{\frac{3}{2}} - x^{\frac{1}{2}} \, dx = \frac{2}{5}x^{\frac{5}{2}} - \frac{2}{3}x^{\frac{3}{2}} \Big|_4^9$

$= 2\left[\frac{1}{5}(\sqrt{9})^5 - \frac{1}{3}(\sqrt{9})^3 - \left[\frac{1}{5}(\sqrt{4})^5 - \frac{1}{3}(\sqrt{4})^3\right]\right] = 2\left[\left[\frac{243}{5} - 9\right] - \left[\frac{32}{5} - \frac{8}{3}\right]\right]$

$\frac{1076}{15}$