Ch. 4.1a - Integrals p. 251-252 #7-23 odd

* Power Rule: $\int u^n du = \frac{u^{n+1}}{n+1} + C$

7) $\int \sqrt[3]{x}\,dx = \int x^{1/3} dx = \frac{x^{1/3+3/3}}{4/3} + C = \boxed{\frac{3}{4}x^{4/3} + C}$

9) $\int \frac{1}{x\sqrt{x}} dx = \int \frac{1}{x \cdot x^{1/2}} dx = \int \frac{1}{x^{3/2}} dx = \int x^{-3/2} dx = \frac{x^{-3/2+2/2}}{-1/2} + C = -2x^{-1/2} + C$

$= \boxed{\frac{-2}{\sqrt{x}} + C}$

15) $\int (x^{3/2} + 2x + 1) dx = \int x^{3/2} dx + \int 2x\,dx + \int 1\,dx$

$= \frac{x^{5/2}}{5/2} + \frac{2x^2}{2} + x + C = \boxed{\frac{2}{5}x^{5/2} + x^2 + x + C}$

21) $\int \frac{x+6}{\sqrt{x}} dx = \int (x+6)x^{-1/2} dx = \int x^{1/2} + 6x^{-1/2} dx = \frac{x^{3/2}}{3/2} + 6 \cdot \frac{x^{1/2}}{1/2} + C$

$= \boxed{\frac{2}{3}x^{3/2} + 12x^{1/2} + C}$

23) $\int (x+1)(3x-2) dx = \int 3x^2 + 3x - 2x - 2\,dx = \int 3x^2 + x - 2\,dx$

$= \frac{3x^3}{3} + \frac{x^2}{2} - 2x + C = \boxed{x^3 + \frac{1}{2}x^2 - 2x + C}$

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#25-31 odd
35, 37, 53, 55, 57

25) $\int (5\cos x + 4\sin x)\,dx = 5\int \cos x\,dx + 4\int \sin x\,dx$

$= \boxed{5\sin x - 4\cos x + C}$

27) $\int (1 - \csc t \cot t)\,dt = \int 1\,dt - \int \csc t \cot t\,dt$

$= \boxed{t + \csc(t) + C}$

29) $\int \sec^2\theta - \sin\theta\,d\theta = \boxed{\tan\theta + \cos\theta + C}$

31) $\int (\tan^2 y + 1)\,dy$ ← * Recall trig identity: $1 + \tan^2 x = \sec^2 x$

$= \int \sec^2 y\,dy = \boxed{\tan y + C}$

35) Find particular solution

$f'(x) = 6x$, $f(0) = 8$ → solve for C

$\int f'(x)\,dx = \int 6x\,dx$

$f(x) = \frac{6x^2}{2} + C$

$f(x) = 3x^2 + C$

$8 = 3(0)^2 + C$

$8 = C$

$\boxed{f(x) = 3x^2 + 8}$

37) $h'(t) = 8t^3 + 5$ $h(1) = -4$

$h(t) = \int 8t^3 + 5\,dt$

$h(t) = \frac{8t^4}{4} + 5t + C$

$h(t) = 2t^4 + 5t + C$

$-4 = 2(1)^4 + 5(1) + C$

$-4 = 7 + C$

$-11 = C$

$\boxed{h(t) = 2t^4 + 5t - 11}$