Answer Key

(1) $f(x) = 12x^2 + 6x - 5$

$\int f(x) = 4x^3 + 3x^2 - 5x + C$

(2) $f(x) = x^3 - 4x^2 + 17$

$\int f(x) = \frac{1}{4}x^4 + \frac{4}{3}x^3 + 17x + C$

(3) $f(x) = 6x^9 - 4x^7 + 3x^2 + 1$

$\int f(x) = \frac{3}{5}x^{10} - \frac{1}{2}x^8 + x^3 + x + C$

(4) $f(x) = x^{99} - 2x^{49} - 1$

$\int f(x) = \frac{1}{100}x^{100} - \frac{1}{25}x^{50} - x + C$

(5) $f(x) = \sqrt{x} + \sqrt[3]{x}$

see notes

(6) $f(x) = \sqrt[3]{x^2} - \sqrt{x^3}$

$f(x) = x^{2/3} - x^{3/2}$

$\int f(x) = \frac{3}{5}x^{5/3} - \frac{2}{5}x^{5/2} + C$

(7) $f(x) = \frac{6}{x^5} = 6x^{-5}$

$\int f(x) = \frac{6}{-4}x^{-4} + C$

$= -\frac{3}{2}x^{-4} + C$

(9) $f(t) = \frac{(t^3 + 2t^2)}{\sqrt{t}}$

$f(t) = t^{5/2} + 2t^{3/2}$

$\int f(t) = \frac{2}{7}t^{7/2} + \frac{4}{5}t^{5/2} + C$

(11) $h(x) = \sin x - 2\cos x$

$\int h(x) = -\cos x - 2\sin x + C$

(12) $f(t) = \sin t - 2\sqrt{t}$

$\int f(t) = -\cos t - \frac{4}{3}t^{3/2} + C$

(14) $f(\theta) = \theta + \sec\theta\tan\theta$

$\int f(\theta) = \frac{\theta^2}{2} + \sec\theta + C$

(16) $f(x) = \dfrac{x^2 + x + 1}{x}$

$f(x) = x + 1 + \frac{1}{x}$

$\int f(x) = \frac{1}{2}x^2 + x + \ln|x| + C$

(17) $f''(x) = x^2 + x^3$

see notes

(18) $f''(x) = 60x^4 - 45x^2$

$f'(x) = \int (60x^4 - 45x^2)\,dx$

$f'(x) = 12x^5 - 15x^3 + C$

$f(x) = \int (12x^5 - 15x^3 + C)\,dx$

$f(x) = 2x^6 - \frac{15x^4}{4} + Cx + D$

(19) $f''(x) = 1$

$f'(x) = x + C$

$f(x) = \int (x + C)\,dx$

$= \frac{1}{2}x^2 + Cx + D$

(20) $f''(x) = \sin x$

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

$f'(x) = -\cos x + C$

$f(x) = \int (-\cos x + C)\,dx$

$= -\sin x + Cx + D$

(23) See notes

(24) $f'(x) = 12x^2 - 24x + 1$ $\qquad f(1) = -2$

$f(x) = \int (12x^2 - 24x + 1)\,dx$

$f(x) = 4x^3 - 12x^2 + x + C$

$-2 = 4(1)^3 - 12(1)^2 + 1 + C$

$-2 = 4 - 12 + 1 + C$

$5 = C$

$f(x) = 4x^3 - 12x^2 + x + 5$

(25) $f'(x) = 3\sqrt{x} - \frac{1}{\sqrt{x}}$ $\quad f(1) = 2$

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

$f(x) = 2x^{3/2} - 2x^{1/2} + C$

$2 = 2(1)^{3/2} - 2(1)^{1/2} + C$

$2 = C$

$f(x) = 2x^{3/2} - 2x^{1/2} + 2$

(27) $f'(x) = 3\cos x + 5\sin x$ $\quad f(0) = 4$

$f(x) = \int (3\cos x + 5\sin x)\,dx$

$f(x) = 3\sin x - 5\cos x + C$

$4 = 3\sin 0 - 5\cos 0 + C$

$4 = 0 - 5 + C$

$9 = C$

$f(x) = 3\sin x - 5\cos x + 9$

(31) $f''(x) = x$ $\quad f(0) = -3$ $\quad f'(0) = 2$

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

$f'(x) = \frac{1}{2}x^2 + C$

$2 = \frac{1}{2}(0)^2 + C$

$2 = C$

$f'(x) = \frac{1}{2}x^2 + 2$

$f(x) = \int (\frac{1}{2}x^2 + 2)\,dx$

$f(x) = \frac{1}{6}x^3 + 2x + C$

$-3 = \frac{1}{6}(0)^3 + 2(0) + C$

$-3 = C$

$f(x) = \frac{1}{6}x^3 + 2x - 3$

(32) ~~$f''(x)$~~ see notes

(33) $f''(x) = x^2 + 3\cos x$

$f(0) = 2, \quad f'(0) = 3$

$f'(x) = \int (x^2 + 3\cos x)\,dx$

$f'(x) = \frac{1}{3}x^3 + 3\sin x + C$

$3 = \frac{1}{3}(0)^3 + 3\sin 0 + C$

$3 = C$

$f'(x) = \frac{1}{3}x^3 + 3\sin x + 3$

$f(x) = \int (\frac{1}{3}x^3 + 3\sin x + 3)\,dx$

$f(x) = \frac{1}{12}x^4 - 3\cos x + 3x + C$

$2 = \frac{1}{12}(0)^4 - 3\cos 0 + 3(0) + C$

$2 = -3 + C$

$5 = C$

$f(x) = \frac{1}{12}x^4 - 3\cos x + 3x + 5$

(34) $f''(x) = x + \sqrt{x}$ $\quad f(1)=1$ $\quad f'(1)=2$

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

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

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

$2 = \frac{1}{2} + \frac{2}{3} + C$

$\frac{12}{6} = \frac{3}{6} + \frac{4}{6} + C$

$\frac{5}{6} = C$

$f'(x) = \frac{1}{2}x^2 + \frac{2}{3}x^{3/2} + \frac{5}{6}$

$f(x) = \int \left(\frac{1}{2}x^2 + \frac{2}{3}x^{3/2} + 5/6\right) dx$

$f(x) = \frac{1}{6}x^3 + \frac{4}{15}x^{5/2} + \frac{5}{6}x + C$

$1 = \frac{1}{6}(1)^3 + \frac{4}{15}(1)^{5/2} + \frac{5}{6}(1) + C$

$1 = \frac{1}{6} + \frac{4}{15} + \frac{5}{6} + C$

$\frac{60}{60} = \frac{10}{60} + \frac{16}{60} + \frac{50}{60} + C$

$\frac{60}{60} = \frac{76}{60} + C$

$\frac{-16}{60} = C$

$\frac{-4}{15} = C$

$f(x) = \frac{1}{6}x^3 + \frac{4}{15}x^{5/2} + \frac{5}{6}x - \frac{4}{15}$

(40) $f'''(x) = \sin x$ $\quad f(0)=1$, $f'(0)=1$ $\quad f''(0)=1$

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

$f''(x) = -\cos x + C$

$1 = -\cos 0 + C$

$2 = C$.

$f''(x) = -\cos x + 2$

$f'(x) = \int (-\cos x + 2)\,dx$

$f'(x) = -\sin x + 2x + C$

$1 = -\sin 0 + 2(0) + C$

$1 = C$

$f'(x) = -\sin x + 2x + 1$

$f(x) = \int (-\sin x + 2x + 1)\,dx$

$f(x) = \cos x + x^2 + x + C$

$1 = \cos 0 + 0^2 + 0 + C$

$0 = C$

$f(x) = \cos x + x^2 + x$.

(43) (b)

(41) $f'(x) = 2x + 1$

$f(x) = \int (2x+1)\,dx$

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

$6 = (1)^2 + (1) + C$

$4 = C$

$f(x) = x^2 + x + 4 \longrightarrow$ Now $f(2) = (2)^2 + 2 + 4$

$= 10$