1 $\int (4x+3)\,dx = 4\cdot\frac{x^2}{2} + 3x + C = 2x^2 + 3x + C$

2 $\int (4x^2 - 8x + 1)\,dx = \frac{4}{3}x^3 - 4x^2 + x + C$

3 $\int (9t^2 - 4t + 3)\,dt = 3t^3 - 2t^2 + 3t + C$

4 $\int (2t^3 - t^2 + 3t - 7)\,dt = \frac{1}{2}t^4 - \frac{1}{3}t^3 + \frac{3}{2}t^2 - 7t + C$

5 $\int \left(\frac{1}{z^3} - \frac{3}{z^2}\right) dz = -\frac{1}{2z^2} + \frac{3}{z} + C$

6 $\int \left(\frac{4}{z^7} - \frac{7}{z^4} + z\right) dz = -\frac{2}{3z^6} + \frac{7}{3z^3} + \frac{1}{2}z^2 + C$

7 $\int \left(3\sqrt{u} + \frac{1}{\sqrt{u}}\right) du = 2u^{3/2} + 2u^{1/2} + C$

8 $\int (\sqrt{u^3} - \frac{1}{2}u^{-2} + 5)\,du = \frac{2}{5}u^{5/2} + \frac{1}{2}u^{-1} + 5u + C$

9 $\int (2v^{5/4} + 6v^{1/4} + 3v^{-4})\,dv = \frac{8}{9}v^{9/4} + \frac{24}{5}v^{5/4} - v^{-3} + C$

10 $\int (3v^5 - v^{5/3})\,dv = \frac{1}{2}v^6 - \frac{3}{8}v^{8/3} + C$

11 $\int (3x-1)^2\,dx = \int (9x^2 - 6x + 1)\,dx = 3x^3 - 3x^2 + x + C$

12 $\int \left(x - \frac{1}{x}\right)^2 dx = \int (x^2 - 2 + x^{-2})\,dx = \frac{1}{3}x^3 - 2x - \frac{1}{x} + C$

13 $\int x(2x+3)\,dx = \int (2x^2 + 3x)\,dx = \frac{2}{3}x^3 + \frac{3}{2}x^2 + C$

14 $\int (2x-5)(3x+1)\,dx = \int (6x^2 - 13x - 5)\,dx = 2x^3 - \frac{13}{2}x^2 - 5x + C$

15 $\int \frac{8x-5}{\sqrt[3]{x}}\,dx = \int (8x^{2/3} - 5x^{-1/3})\,dx = \frac{24}{5}x^{5/3} - \frac{15}{2}x^{2/3} + C$

16 $\int \frac{2x^2 - x + 3}{\sqrt{x}}\,dx = \int (2x^{3/2} - x^{1/2} + 3x^{-1/2})\,dx = \frac{4}{5}x^{5/2} - \frac{2}{3}x^{3/2} + 6x^{1/2} + C$

17 $\int \frac{x^3 - 1}{x - 1}\,dx = \int (x^2 + x + 1)\,dx \ (x \neq 1) = \frac{1}{3}x^3 + \frac{1}{2}x^2 + x + C$

18 $\int \frac{x^3 + 3x^2 - 9x - 2}{x - 2}\,dx = \int (x^2 + 5x + 1)\,dx \ (x \neq 2) = \frac{1}{3}x^3 + \frac{5}{2}x^2 + x + C$

19 $\int \frac{(t^2+3)^2}{t^6}\,dt = \int \frac{t^4 + 6t^2 + 9}{t^6}\,dt =$

$\int (t^{-2} + 6t^{-4} + 9t^{-6})\,dt = -t^{-1} - 2t^{-3} - \frac{9}{5}t^{-5} + C$

20 $\int \frac{(\sqrt{t}+2)^2}{t^3}\,dt = \int \frac{t + 4\sqrt{t} + 4}{t^3}\,dt =$

$\int (t^{-2} + 4t^{-5/2} + 4t^{-3})\,dt = -t^{-1} - \frac{8}{3}t^{-3/2} - 2t^{-2} + C$

21 $\int \frac{3}{4}\cos u\,du = \frac{3}{4}\int \cos u\,du = \frac{3}{4}\sin u + C$

22 $\int -\frac{1}{5}\sin u\,du = -\frac{1}{5}\int \sin u\,du = \frac{1}{5}\cos u + C$

23 $\int \frac{7}{\csc x}\,dx = 7\int \sin x\,dx = -7\cos x + C$

[24] $\int \frac{1}{4\sec x}\,dx = \frac{1}{4}\int \cos x\,dx = \frac{1}{4}\sin x + C$

[25] $\int (\sqrt{t} + \cos t)\,dt = \frac{2}{3}t^{3/2} + \sin t + C$

[26] $\int (\sqrt[3]{t^2} - \sin t)\,dt = \frac{3}{5}t^{5/3} + \cos t + C$

[27] $\int \frac{\sec t}{\cos t}\,dt = \int \sec^2 t\,dt = \tan t + C$

[28] $\int \frac{1}{\sin^2 t}\,dt = \int \csc^2 t\,dt = -\cot t + C$

[29] $\int (\csc v \cot v \sec v)\,dv = \int \csc^2 v\,dv = -\cot v + C$

[30] $\int (4 + 4\tan^2 v)\,dv = 4\int (1 + \tan^2 v)\,dv = 4\int \sec^2 v\,dv = 4\tan v + C$

[31] $\int \frac{\sec w \sin w}{\cos w}\,dw = \int \sec w \tan w\,dw = \sec w + C$

[32] $\int \frac{\csc w \cos w}{\sin w}\,dw = \int \csc w \cot w\,dw = -\csc w + C$

[33] $\int \frac{(1 + \cot^2 z)\cot z}{\csc z}\,dz = \int \frac{\csc^2 z \cot z}{\csc z}\,dz = \int \csc z \cot z\,dz = -\csc z + C$

[34] $\int \frac{\tan z}{\cos z}\,dz = \int \tan z \sec z\,dz = \sec z + C$

[35] By Theorem (5.5)(i), $\int D_x \sqrt{x^2 + 4}\,dx = \sqrt{x^2 + 4} + C.$

[36] By Theorem (5.5)(i), $\int D_x \sqrt[3]{x^3 - 8}\,dx = \sqrt[3]{x^3 - 8} + C.$

[37] By Theorem (5.5)(i), $\int \frac{d}{dx}(\sin \sqrt[3]{x})\,dx = \sin \sqrt[3]{x} + C.$

[38] By Theorem (5.5)(i), $\int \frac{d}{dx}(\sqrt{\tan x})\,dx = \sqrt{\tan x} + C.$

[39] By Theorem (5.5)(ii), $D_x \int (x^3 \sqrt{x - 4})\,dx = x^3 \sqrt{x - 4}.$

[40] By Theorem (5.5)(ii), $D_x \int (x^4 \sqrt[3]{x^2 + 9})\,dx = x^4 \sqrt[3]{x^2 + 9}.$

[41] By Theorem (5.5)(ii), $\frac{d}{dx}\int \cot x^3\,dx = \cot x^3.$

[42] By Theorem (5.5)(ii), $\frac{d}{dx}\int \cos\sqrt{x^2 + 1}\,dx = \cos\sqrt{x^2 + 1}.$

[43] $\int a^2\,dx = a^2\int dx = a^2 x + C$

[44] $\int ab\,dx = ab\int dx = abx + C$

[45] $\int (at + b)\,dt = a\cdot\frac{t^2}{2} + bt + C = \frac{1}{2}at^2 + bt + C$

[46] $\int \left(\frac{a}{b^2}t\right)dt = \frac{a}{b^2}\int t\,dt = \frac{a}{2b^2}t^2 + C$

[47] $\int (a + b)\,du = (a + b)\int du = (a + b)u + C$

[48] $\int (b - a^2)\,du = (b - a^2)\int du = (b - a^2)u + C$

[49] $f'(x) = 12x^2 - 6x + 1 \Rightarrow f(x) = 4x^3 - 3x^2 + x + C.$
$f(1) = 5 \Rightarrow 2 + C = 5 \Rightarrow C = 3.$

[50] $f'(x) = 9x^2 + x - 8 \Rightarrow f(x) = 3x^3 + \frac{1}{2}x^2 - 8x + C.$
$f(-1) = 1 \Rightarrow \frac{11}{2} + C = 1 \Rightarrow C = -\frac{9}{2}.$

[51] $\frac{dy}{dx} = 4x^{1/2} \Rightarrow y = \frac{8}{3}x^{3/2} + C.$ $x = 4 \Rightarrow y = \frac{64}{3} + C = 21 \Rightarrow C = -\frac{1}{3}.$

[52] $\frac{dy}{dx} = 5x^{-1/3} \Rightarrow y = \frac{15}{2}x^{2/3} + C.$ $x = 27 \Rightarrow y = \frac{135}{2} + C = 70 \Rightarrow C = \frac{5}{2}.$

[53] $f''(x) = 4x - 1 \Rightarrow f'(x) = 2x^2 - x + C.$ $f'(2) = -2 \Rightarrow C = -8.$
$f(x) = \frac{2}{3}x^3 - \frac{1}{2}x^2 - 8x + D.$ $f(1) = 3 \Rightarrow D = \frac{65}{6}.$

54 $f''(x) = 6x - 4 \Rightarrow f'(x) = 3x^2 - 4x + C$. $f'(2) = 5 \Rightarrow C = 1$.

$f(x) = x^3 - 2x^2 + x + D$. $f(2) = 4 \Rightarrow D = 2$.

55 $\dfrac{d^2y}{dx^2} = 3\sin x - 4\cos x \Rightarrow \dfrac{dy}{dx} = -3\cos x - 4\sin x + C$. $x = 0 \Rightarrow -3 + C = 2 \Rightarrow$

$C = 5$. $y = -3\sin x + 4\cos x + 5x + D$. $x = 0 \Rightarrow 4 + D = 7 \Rightarrow D = 3$.

56 $\dfrac{d^2y}{dx^2} = 2\cos x - 5\sin x \Rightarrow \dfrac{dy}{dx} = 2\sin x + 5\cos x + C$.

$x = \pi \Rightarrow -5 + C = 3 \Rightarrow C = 8$. $y = -2\cos x + 5\sin x + 8x + D$.

$x = \pi \Rightarrow 2 + 8\pi + D = 2 + 6\pi \Rightarrow D = -2\pi$.

57 Since $a(t) = v'(t)$, $v(t) = 2t - 3t^2 + C$. $v(0) = -5 \Rightarrow C = -5$.

Since $v(t) = s'(t)$, $s(t) = t^2 - t^3 - 5t + D$. $s(0) = 4 \Rightarrow D = 4$.

58 Since $a(t) = v'(t)$, $v(t) = t^3 + C$. $v(0) = 20 \Rightarrow C = 20$.

Since $v(t) = s'(t)$, $s(t) = \frac{1}{4}t^4 + 20t + D$. $s(0) = 5 \Rightarrow D = 5$.

59 (a) $a(t) = -32 \Rightarrow v(t) = -32t + C$. $v(0) = 1600 \Rightarrow C = 1600$.

$s(t) = -16t^2 + 1600t + D$. $s(0) = 0 \Rightarrow D = 0$.

(b) The maximum height occurs when $v(t) = -32t + 1600 = 0$, or $t = 50$.

$s(50) = 40{,}000$ ft.

60 (a) $a(t) = -32 \Rightarrow v(t) = -32t + C$. $v(0) = 0 \Rightarrow C = 0$. $s(t) = -16t^2 + D$.

$s(0) = 1000 \Rightarrow D = 1000$ and $s(t) = -16t^2 + 1000$.

Hence, the object falls $16t^2$ feet in t seconds.

(b) $v(3) = -32(3) = -96$ ft/sec.

(c) When $s(t) = 0$, $-16t^2 + 1000 = 0$ and $t = \frac{5}{2}\sqrt{10} \approx 7.9$ sec.

61 (a) $a(t) = -32 \Rightarrow v(t) = -32t + C$. $v(0) = -16 \Rightarrow C = -16$.

$s(t) = -16t^2 - 16t + D$. $s(0) = 96 \Rightarrow D = 96$

(b) $s(t) = -16t^2 - 16t + 96 = 0$ when $t = 2$ (-3 is rejected.).

(c) $v(2) = -32(2) - 16 = -80$ ft/sec.

$a(t) = -g \Rightarrow v(t) = -gt + C$. $v(0) = v_0 \Rightarrow$

$\ldots = s_0 \Rightarrow s(t) =$