5.3.10 Because f is an antiderivative of f', the Fundamental Theorem assures us that $\int_a^b f'(x)\,dx = f(b) - f(a)$.

5.3.11 $\int_3^8 f'(t)\,dt = f(8) - f(3) = 20 - 4 = 16$.

5.3.12 $\int_2^7 3\,dx = 3x\Big|_2^7 = 21 - 6 = 15$. The integral represents the area of a 5×3 rectangle, which is 15.

5.3.13

a. $A(-2) = \int_{-2}^{-2} f(t)\,dt = 0$.

b. $F(8) = \int_4^8 f(t)\,dt = -9$.

c. $A(4) = \int_{-2}^{4} f(t)\,dt = 8 + 17 = 25$.

d. $F(4) = \int_4^4 f(t)\,dt = 0$.

e. $A(8) = \int_{-2}^{8} f(t)\,dt = 25 - 9 = 16$.

5.3.14

a. $A(2) = \int_0^2 f(t)\,dt = 8$.

b. $F(5) = \int_2^5 f(t)\,dt = -5$.

c. $A(0) = \int_0^0 f(t)\,dt = 0$.

d. $F(8) = \int_2^8 f(t)\,dt = -16$.

e. $A(8) = \int_0^8 f(t)\,dt = 8 - 16 = -8$.

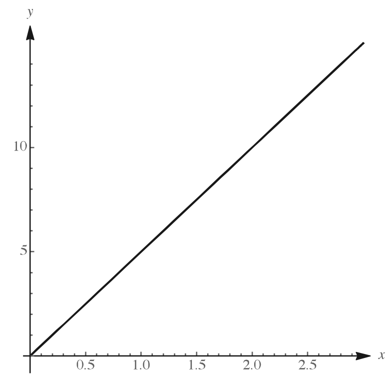
f. $A(5) = \int_0^5 f(t)\,dt = 8 - 5 = 3$.

g. $F(2) = \int_2^2 f(t)\,dt = 0$.

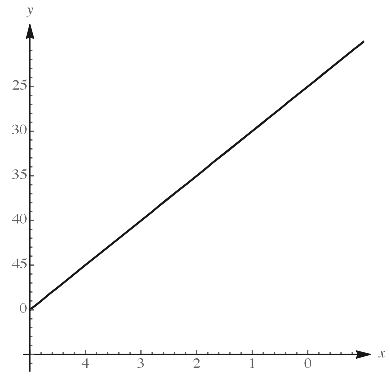
5.3.15

a. $A(x) = \int_0^x f(t)\,dt = \int_0^x 5\,dt = 5x$.

b. $A'(x) = 5 = f(x)$.



5.3.16



a. $A(x) = \int_{-5}^{x} f(t)\,dt = \int_{-5}^{x} 5\,dt = 5(x+5)$.

b. $A'(x) = 5 = f(x)$.

5.3.17

a. $A(2) = \int_{0}^{2} t\,dt = 2$. $A(4) = \int_{0}^{4} t\,dt = 8$. Because the region whose area is $A(x) = \int_{0}^{x} t\,dt$ is a triangle with base x and height x, its value is $\frac{1}{2}x^2$.

b. $F(4) = \int_{2}^{4} t\,dt = 6$. $F(6) = \int_{2}^{6} t\,dt = 16$. Because the region whose area is $A(x) = \int_{2}^{x} t\,dt$ is a trapezoid with base $x-2$ and $h_1 = 2$ and $h_2 = x$, its value is $(x-2)\frac{2+x}{2} = \frac{x^2-4}{2} = \frac{x^2}{2} - 2$.

c. We have $A(x) - F(x) = \frac{x^2}{2} - (\frac{x^2}{2} - 2) = 2$, a constant.

5.3.18

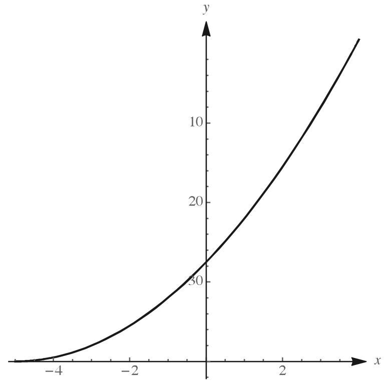
a. $A(2) = \int_{1}^{2} (2t-2)\,dt = 1$. $A(3) = \int_{1}^{3} (2t-2)\,dt = 4$. Because the region whose area is $A(x) = \int_{1}^{x} (2t-2)\,dt$ is a triangle with base $x-1$ and height $2x-2$, its value is $\frac{1}{2} \cdot (x-1)(2(x-1)) = (x-1)^2$.

b. $F(5) = \int_{4}^{5} (2t-2)\,dt = 7$. $F(6) = \int_{4}^{6} (2t-2)\,dt = 16$. Because the region whose area is $A(x) = \int_{2}^{x} t\,dt$ is a trapezoid with base $x-4$ and $h_1 = 6$ and $h_2 = 2x-2$, its value is $(x-4)\left(\frac{6+2x-2}{2}\right) = (x-4)(x+2) = x^2 - 2x - 8$.

c. We have $A(x) - F(x) = x^2 - 2x + 1 - (x^2 - 2x - 8) = 9$, a constant.

5.3.19

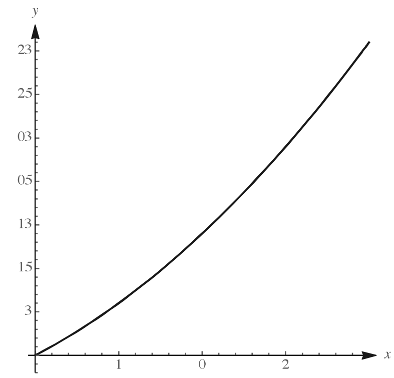
a. The region is a triangle with base $x + 5$ and height $x + 5$, so its area is $A(x) = \frac{1}{2}(x + 5)^2$.



b. $A'(x) = x + 5 = f(x)$.

5.3.20

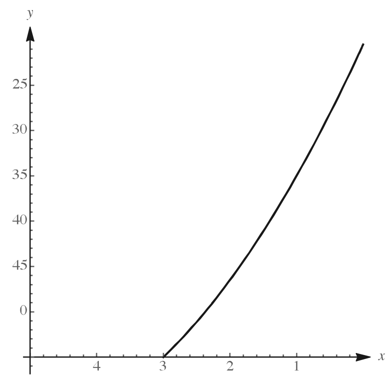
a. The region is a trapezoid with base x and heights $h_1 = f(0) = 5$ and $h_2 = f(x) = 2x + 5$, so its area is $A(x) = x \cdot \frac{5 + 2x + 5}{2} = x \cdot (x + 5) = x^2 + 5x$.



b. $A'(x) = 2x + 5 = f(x)$.

5.3.21

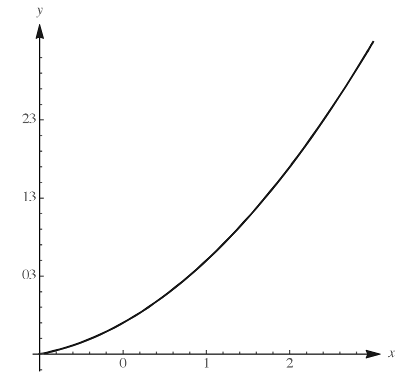
a. The region is a trapezoid with base $x - 2$ and heights $h_1 = f(2) = 7$ and $h_2 = f(x) = 3x + 1$, so its area is $A(x) = (x - 2) \cdot \frac{7 + 3x + 1}{2} = (x - 2) \cdot (\frac{3}{2}x + 4) = \frac{3}{2}x^2 + x - 8$.



b. $A'(x) = 3x + 1 = f(x)$.

5.3.22

a. The region is a trapezoid with base x and heights $h_1 = f(0) = 2$ and $h_2 = f(x) = 4x+2$, so its area is $A(x) = (x) \cdot \dfrac{2+4x+2}{2} = (x) \cdot (2x+2) = 2x^2 + 2x$.



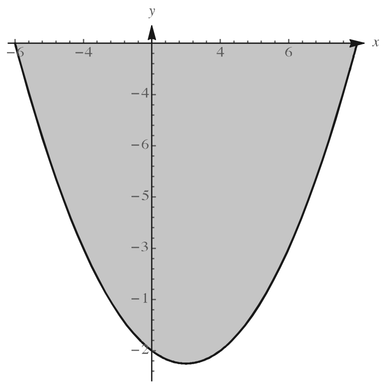
b. $A'(x) = 4x + 2 = f(x)$.

5.3.23 $\displaystyle\int_0^1 (x^2 - 2x + 3)\,dx = \left(\frac{x^3}{3} - x^2 + 3x\right)\bigg|_0^1 = \frac{1}{3} - 1 + 3 - (0 - 0 + 0) = \frac{7}{3}$. It does appear that the area is between 2 and 3.

5.3.24 $\displaystyle\int_{-\pi/4}^{7\pi/4} (\sin x + \cos x)\,dx = (-\cos x + \sin x)\bigg|_{-\pi/4}^{7\pi/4} = -\sqrt{2}/2 + -\sqrt{2}/2 - (-\sqrt{2}/2 + -\sqrt{2}/2) = 0$. It does appear that the area above the axis is equal to the area below, so the net area is 0.

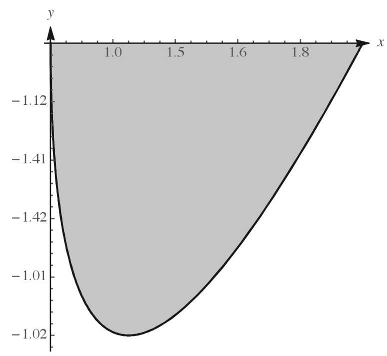
5.3.25

$$\int_{-2}^{3} (x^2 - x - 6)\,dx = \left(\frac{x^3}{3} - \frac{x^2}{2} - 6x\right)\bigg|_{-2}^{3} = -\frac{125}{6}.$$

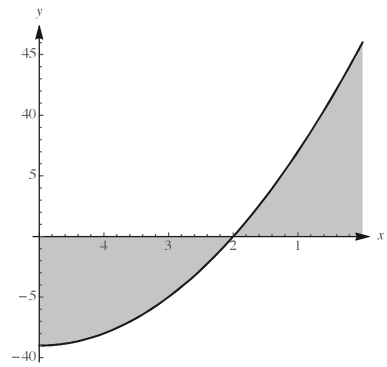


5.3.26

$$\int_0^1 (x - \sqrt{x})\,dx = \left(\frac{x^2}{2} - \frac{2}{3}x^{3/2}\right)\bigg|_0^1 = \frac{1}{2} - \frac{2}{3} - (0 - 0) = -\frac{1}{6}.$$

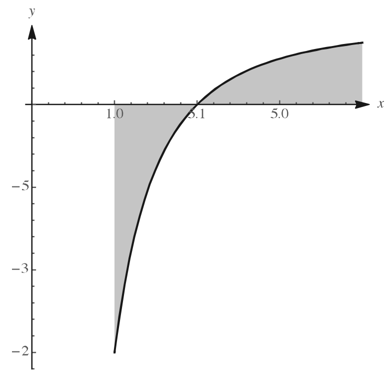


5.3.27



$$\int_0^5 (x^2-9)\,dx = \left(\frac{x^3}{3}-9x\right)\Bigg|_0^5 = \frac{125}{3}-45-(0-0) = -\frac{10}{3}.$$

5.3.28



$$\int_{1/2}^2 \left(1-\frac{1}{x^2}\right)\,dx = \left(x+\frac{1}{x}\right)\Bigg|_{1/2}^2 = 2+\frac{1}{2}-\left(\frac{1}{2}+2\right) = 0.$$

5.3.29 $\displaystyle\int_0^2 4x^3\,dx = x^4\Bigg|_0^2 = 16-0 = 16.$

5.3.30 $\displaystyle\int_0^2 (3x^2+2x)\,dx = \left(x^3+x^2\right)\Bigg|_0^2 = (8+4)-(0+0) = 12.$

5.3.31 $\displaystyle\int_1^8 8x^{1/3}\,dx = 6x^{4/3}\Bigg|_1^8 = 6(16-1) = 90.$

5.3.32 $\displaystyle\int_1^{16} x^{-5/4}\,dx = -4x^{-1/4}\Bigg|_1^{16} = -4\left(\frac{1}{2}-1\right) = 2.$

5.3.33 $\displaystyle\int_0^1 (x+\sqrt{x})\,dx = \left(\frac{x^2}{2}+\frac{2x^{3/2}}{3}\right)\Bigg|_0^1 = \frac{1}{2}+\frac{2}{3}-(0+0) = \frac{7}{6}.$

5.3.34 $\displaystyle\int_0^{\pi/4} 2\cos x\,dx = 2\sin x\Bigg|_0^{\pi/4} = \frac{2\sqrt{2}}{2}-0 = \sqrt{2}.$

5.3.35 $\displaystyle\int_1^9 \frac{2}{\sqrt{x}}\,dx = \int_1^9 2x^{-1/2}\,dx = 4x^{1/2}\Bigg|_1^9 = 12-4 = 8.$

5.3.36 $\displaystyle\int_4^9 \frac{2+\sqrt{t}}{\sqrt{t}}\,dt = \int_4^9 \left(2t^{-1/2}+1\right)\,dt = (4t^{1/2}+t)\Bigg|_4^9 = 12+9-(8+4) = 9.$

5.3.37 $\displaystyle\int_{-2}^{2}(x^2-4)\,dx = \left(\frac{x^3}{3}-4x\right)\Big|_{-2}^{2} = \frac{8}{3}-8-\left(-\frac{8}{3}+8\right) = \frac{16}{3}-16 = -\frac{32}{3}.$

5.3.38 $\displaystyle\int_{0}^{\ln 8} e^x\,dx = e^x\Big|_{0}^{\ln 8} = e^{\ln 8}-e^0 = 8-1 = 7.$

5.3.39 $\displaystyle\int_{1/2}^{1}(x^{-3}-8)\,dx = \left(\frac{x^{-2}}{-2}-8x\right)\Big|_{1/2}^{1} = -\frac{1}{2}-8-(-2-4) = -\frac{5}{2}.$

5.3.40 $\displaystyle\int_{0}^{4} x(x-2)(x-4)\,dx = \int_{0}^{4}(x^3-6x^2+8x)\,dx = \left(\frac{x^4}{4}-2x^3+4x^2\right)\Big|_{0}^{4} = 64-128+64-0 = 0.$

5.3.41 $\displaystyle\int_{1}^{4}(1-x)(x-4)\,dx = \int_{1}^{4}(-x^2+5x-4)\,dx = \left(-\frac{x^3}{3}+\frac{5x^2}{2}-4x\right)\Big|_{1}^{4} = \frac{9}{2}.$

5.3.42 $\displaystyle\int_{0}^{1/2}\frac{dx}{\sqrt{1-x^2}} = \sin^{-1}x\Big|_{0}^{1/2} = \sin^{-1}(1/2)-\sin^{-1}0 = \pi/6-0 = \pi/6.$

5.3.43 $\displaystyle\int_{-2}^{-1} x^{-3}\,dx = \frac{x^{-2}}{-2}\Big|_{-2}^{-1} = -\frac{1}{2x^2}\Big|_{-2}^{-1} = -\frac{1}{2}-\left(-\frac{1}{8}\right) = -\frac{3}{8}.$

5.3.44 $\displaystyle\int_{0}^{\pi}(1-\sin x)\,dx = (x+\cos x)\Big|_{0}^{\pi} = \pi-1-(0+1) = \pi-2.$

5.3.45 $\displaystyle\int_{0}^{\pi/4}\sec^2\theta\,d\theta = \tan\theta\Big|_{0}^{\pi/4} = 1-0 = 1.$

5.3.46 $\displaystyle\int_{-\pi/2}^{\pi/2}(\cos x-1)\,dx = (\sin x-x)\Big|_{-\pi/2}^{\pi/2} = 1-\frac{\pi}{2}-\left(-1-\left(-\frac{\pi}{2}\right)\right) = 2-\pi.$

5.3.47 $\displaystyle\int_{1}^{2}\frac{3}{t}\,dt = 3\ln|t|\Big|_{1}^{2} = 3\ln 2-3\ln 1 = \ln 8.$

5.3.48 $\displaystyle\int_{4}^{9}\frac{x-\sqrt{x}}{x^2}\,dx = \int_{4}^{9}(x^{-1}-x^{-3/2})\,dx = (\ln|x|+2x^{-1/2})\Big|_{4}^{9} = \ln 9+\frac{2}{3}-(\ln 4+1) = \ln\left(\frac{9}{4}\right)-\frac{1}{3}.$

5.3.49 $\displaystyle\int_{1}^{8}\sqrt[3]{y}\,dy = \frac{3}{4}y^{4/3}\Big|_{1}^{8} = 12-\frac{3}{4} = \frac{45}{4}.$

5.3.50 $\displaystyle\frac{1}{2}\int_{0}^{\ln 2} e^x\,dx = \frac{1}{2}\left(e^x\Big|_{0}^{\ln 2}\right) = \frac{1}{2}(2-1) = \frac{1}{2}.$

5.3.51

$$\begin{aligned}\int_{1}^{4}\frac{x-2}{\sqrt{x}}\,dx &= \int_{1}^{4}\left(\frac{x}{\sqrt{x}}-\frac{2}{\sqrt{x}}\right)dx = \int_{1}^{4}\left(x^{1/2}-2x^{-1/2}\right)dx\\ &= \left(\frac{2}{3}x^{3/2}-4x^{1/2}\right)\Big|_{1}^{4} = \frac{16}{3}-8-\left(\frac{2}{3}-4\right) = \frac{14}{3}-\frac{12}{3} = \frac{2}{3}.\end{aligned}$$

5.3.52 $\displaystyle\int_{1}^{2}\left(\frac{2}{s}-\frac{4}{s^3}\right)ds = \left(2\ln|s|+\frac{2}{s^2}\right)\Big|_{1}^{2} = 2\ln 2+\frac{1}{2}-(0+2) = \ln 4-\frac{3}{2}.$

5.3.53 $\displaystyle\int_0^{\pi/3} \sec x \tan x\, dx = \sec x \Big|_0^{\pi/3} = 2 - 1 = 1.$

5.3.54 $\displaystyle\int_{\pi/4}^{\pi/2} \csc^2\theta\, d\theta = -\cot\theta \Big|_{\pi/4}^{\pi/2} = 0 + 1 = 1.$

5.3.55 $\displaystyle\int_{\pi/4}^{3\pi/4} (\cot^2 x + 1)\, dx = \int_{\pi/4}^{3\pi/4} \csc^2 x\, dx = -\cot x \Big|_{\pi/4}^{3\pi/4} = -(-1-1) = 2.$

5.3.56 $\displaystyle\int_0^1 10e^{x+3}\, dx = 10e^{x+3}\Big|_0^1 = 10e^4 - 10e^3 = 10e^3(e-1).$

5.3.57 $\displaystyle\int_1^{\sqrt{3}} \frac{1}{1+x^2}\, dx = \tan^{-1}\Big|_1^{\sqrt{3}} = \tan^{-1}\sqrt{3} - \tan^{-1} 1 = \pi/3 - \pi/4 = \pi/12.$

5.3.58 $\displaystyle\int_0^{\pi/4} \sec x(\sec x + \cos x)\, dx = \int_0^{\pi/4} (\sec^2 x + 1)\, dx = (\tan x + x)\Big|_0^{\pi/4} = 1 + \pi/4 - (0+0) = 1 + \pi/4.$

5.3.59 $\displaystyle\int_1^2 \frac{z^2+4}{z}\, dz = \int_1^2 \left(z + \frac{4}{z}\right) dz = \left(\frac{z^2}{2} + 4\ln z\right)\Big|_1^2 = 2 + 4\ln 2 - \left(\frac{1}{2} + 0\right) = \ln 16 + \frac{3}{2}.$

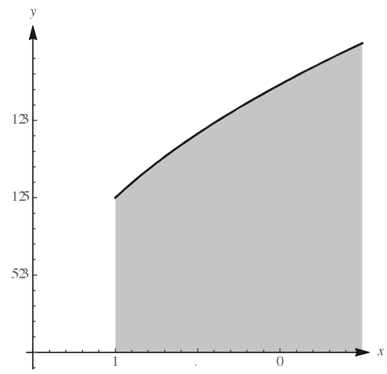
5.3.60 $\displaystyle\int_{\sqrt{2}}^2 \frac{dx}{x\sqrt{x^2-1}} = \sec^{-1} x \Big|_{\sqrt{2}}^2 = \frac{\pi}{3} - \frac{\pi}{4} = \frac{\pi}{12}.$

5.3.61 $\displaystyle\int_0^{\pi} f(x)\, dx = \int_0^{\pi/2} (\sin x + 1)\, dx + \int_{\pi/2}^{\pi} (2\cos x + 2)\, dx = (-\cos x + x)\Big|_0^{\pi/2} + (2\sin x + 2x)\Big|_{\pi/2}^{\pi} =$ $(0 + \pi/2) - (-1+0) + (0 + 2\pi) - (2 + \pi) = 3\pi/2 - 1.$

5.3.62 $\displaystyle\int_1^3 g(x)\, dx = \int_1^2 (3x^2 + 4x + 1)\, dx + \int_2^3 (2x+5)\, dx = (x^3 + 2x^2 + x)\Big|_1^2 + (x^2 + 5x)\Big|_2^3 = (8+8+2) -$ $(1+2+1) + (9+15) - (4+10) = 24.$

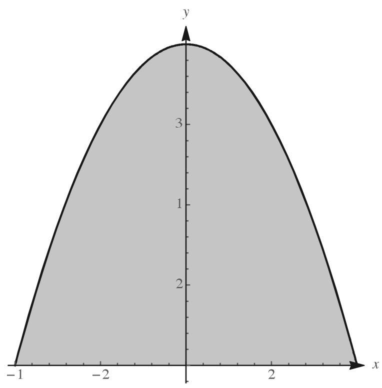
5.3.63

The area (and net area) of this region is given by $\displaystyle\int_1^4 \sqrt{x}\, dx = \frac{2}{3}x^{3/2}\Big|_1^4 = \frac{16}{3} - \frac{2}{3} = \frac{14}{3}.$



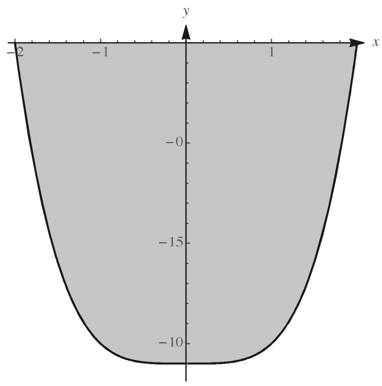
5.3.64

The area (and net area) of this region is given by $\int_{-2}^{2}(4-x^2)\,dx = \left(4x-\frac{x^3}{3}\right)\Big|_{-2}^{2} = 8-\frac{8}{3}-\left(-8+\frac{8}{3}\right) = 16-\frac{16}{3} = \frac{32}{3}$.



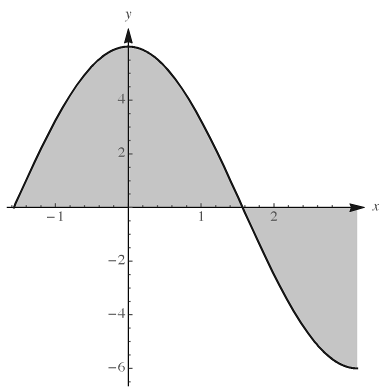
5.3.65

The net area of this region is given by $\int_{-2}^{2}(x^4-16)\,dx = \left(\frac{x^5}{5}-16x\right)\Big|_{-2}^{2} = \frac{32}{5}-32-\left(-\frac{32}{5}+32\right) = \frac{64}{5}-64 = -\frac{256}{5}$. Thus the area is $\frac{256}{5}$.



5.3.66

The net area of this region is given by $\int_{-\pi/2}^{\pi} 6\cos x\,dx = 6\sin x\Big|_{-\pi/2}^{\pi} = 0 - -6 = 6$. The area is given by $\int_{-\pi/2}^{\pi/2} 6\cos x\,dx - \int_{\pi/2}^{\pi} 6\cos x\,dx = 6\sin x\Big|_{-\pi/2}^{\pi/2} - 6\sin x\Big|_{\pi/2}^{\pi} = 6 - -6 - (0-6) = 18$.



5.3.67 Because this region is below the axis, the area of it is given by $-\int_{2}^{4}(x^2-25)\,dx = -\left(\frac{x^3}{3}-25x\right)\Big|_{2}^{4} = -\left(\frac{64}{3}-100-\left(\frac{8}{3}-50\right)\right) = 50-\frac{56}{3} = \frac{94}{3}$.

5.3.68 Because the function is below the axis between -1 and 1, and is above the axis between 1 and 2, the area of the bounded region is given by $-\int_{-1}^{1}(x^3-1)\,dx+\int_{1}^{2}(x^3-1)\,dx = -\left(\frac{x^4}{4}-x\right)\Big|_{-1}^{1}+\left(\frac{x^4}{4}-x\right)\Big|_{1}^{2} =$ $-\left(\frac{1}{4}-1-\left(\frac{1}{4}+1\right)\right)+\left(4-2-\left(\frac{1}{4}-1\right)\right) = 2+2.75 = 4.75.$

5.3.69 Because this region is below the axis, the area of it is given by $-\int_{-2}^{-1}\frac{1}{x}\,dx = -\left(\ln|x|\,\Big|_{-2}^{-1}\right) =$ $\ln 2 - \ln 1 = \ln 2.$

5.3.70 Because the function is above the axis between -1 and 0 and is below the axis between 0 and 2, the area is given by $\int_{-1}^{0}(x^3-x^2-2x)\,dx - \int_{0}^{2}(x^3-x^2-2x)\,dx = \left(\frac{x^4}{4}-\frac{x^3}{3}-x^2\right)\Big|_{-1}^{0} - \left(\frac{x^4}{4}-\frac{x^3}{3}-x^2\right)\Big|_{0}^{2} =$ $\left(0-\left(\frac{1}{4}+\frac{1}{3}-1\right)\right)-\left(4-\frac{8}{3}-4-0\right) = \frac{5}{12}+\frac{8}{3} = \frac{37}{12}.$

5.3.71 The area is given by

$$-\int_{-\pi/4}^{0}\sin x\,dx + \int_{0}^{3\pi/4}\sin x\,dx = \left(\cos x\,\Big|_{-\pi/4}^{0}\right)+\left(-\cos x\,\Big|_{0}^{3\pi/4}\right) = \left(1-\frac{\sqrt{2}}{2}\right)+\left(1+\frac{\sqrt{2}}{2}\right) = 2.$$

5.3.72 Because this region is below the axis, the area is given by $-\int_{\pi/2}^{\pi}\cos x\,dx = -\left(\sin x\,\Big|_{\pi/2}^{\pi}\right) =$ $\sin(\pi/2)-\sin(\pi) = 1.$

5.3.73 By a direct application of the Fundamental Theorem, this is x^2+x+1.

5.3.74 $\frac{d}{dx}\int_{x}^{1}e^{t^2}\,dt = -\frac{d}{dx}\int_{1}^{x}e^{t^2}\,dt = -e^{x^2}.$

5.3.75 This is $-\frac{d}{dx}\int_{1}^{x}\sqrt{t^4+1}\,dt = -\sqrt{x^4+1}.$

5.3.76 This is $-\frac{d}{dx}\int_{0}^{x}\frac{dp}{p^2+1} = \frac{-1}{x^2+1}.$

5.3.77 By the Fundamental Theorem and the chain rule, this is $\frac{1}{x^6}\cdot 3x^2 = \frac{3}{x^4}.$

5.3.78 $\frac{d}{dx}\int_{0}^{x^2}\frac{1}{t^2+4}\,dt = \frac{2x}{x^4+4}.$

5.3.79 $\frac{d}{dx}\int_{0}^{\cos x}(t^4+6)\,dt = -(\cos^4 x+6)\sin x.$

5.3.80 $\frac{d}{dw}\int_{0}^{\sqrt{w}}\ln(x^2+1)\,dx = \ln(w+1)\cdot\frac{1}{2\sqrt{w}} = \frac{\ln(w+1)}{2\sqrt{w}}.$

5.3.81 $\frac{d}{dz}\int_{\sin z}^{10}\frac{dt}{t^4+1} = -\frac{d}{dz}\int_{10}^{\sin z}\frac{dt}{t^4+1} = -\frac{1}{\sin^4+1}\cdot\cos z = -\frac{\cos z}{\sin^4 z+1}.$

5.3.82 $\frac{d}{dy}\int_{y^3}^{10}\sqrt{x^6+1}\,dx = -\frac{d}{dy}\int_{10}^{y^3}\sqrt{x^6+1}\,dx = -\sqrt{y^{18}+1}\cdot 3y^2 = -3y^2\sqrt{y^{18}+1}.$

5.3.83 $\frac{d}{dt}\left(\int_{1}^{t}\frac{3}{x}\,dx - \int_{t^2}^{1}\frac{3}{x}\,dx\right) = \frac{d}{dt}\int_{1}^{t}\frac{3}{x}\,dx + \frac{d}{dt}\int_{1}^{t^2}\frac{3}{x}\,dx = \frac{3}{t}+\frac{6t}{t^2} = \frac{9}{t}.$

5.3.84 $\dfrac{d}{dt}\left(\displaystyle\int_0^t \frac{dx}{1+x^2} + \int_0^{1/t} \frac{dx}{1+x^2}\right) = \dfrac{1}{1+t^2} + \dfrac{1}{1+(1/t)^2}\left(-\dfrac{1}{t^2}\right) = \dfrac{1}{1+t^2} - \dfrac{1}{1+t^2} = 0.$

5.3.85 This can be written as

$$\begin{aligned}\frac{d}{dx}\left(\int_{-x}^{0} \sqrt{1+t^2}\,dt + \int_0^x \sqrt{1+t^2}\,dt\right) &= \frac{d}{dx}\left(-\int_0^{-x} \sqrt{1+t^2}\,dt + \int_0^x \sqrt{1+t^2}\,dt\right)\\ &= -\sqrt{1+(-x)^2}(-1) + \sqrt{1+x^2} = 2\sqrt{1+x^2}.\end{aligned}$$

5.3.86 This can be written as

$$\begin{aligned}\frac{d}{dx}\left(\int_{e^x}^{0} \ln(t^2)\,dt + \int_0^{e^{2x}} \ln(t^2)\,dt\right) &= \frac{d}{dx}\left(-\int_0^{e^x} \ln(t^2)\,dt + \int_0^{e^{2x}} \ln(t^2)\,dt\right)\\ &= -\ln((e^x)^2)\cdot e^x + \ln((e^{2x})^2)\cdot 2e^{2x} = -2xe^x + 8xe^{2x} = 2xe^x(4e^x - 1).\end{aligned}$$

5.3.87

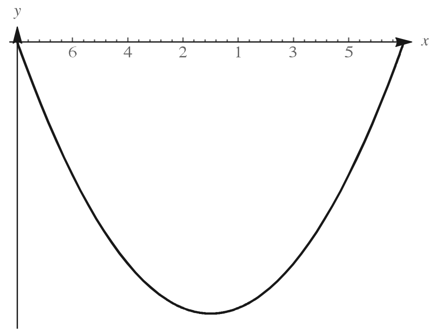
(a) matches with (C) – its area function is increasing linearly.
(b) matches with (B) – its area function increases then decreases.
(c) matches with (D) – its area function is always increasing on $[0, b]$, although not linearly.
(d) matches with (A) – its area function decreases at first and then eventually increases.

5.3.88

a. It appears that $A(x) = 0$ for $x = 0$ and $x = 10$.

b. A has a local minimum at $x = 5$ where the area function changes from decreasing to increasing.

c.



5.3.89

a. It appears that $A(x) = 0$ for $x = 0$ and at about $x = 3$.

b. A has a local minimum at about $x = 1.5$ where the area function changes from decreasing to increasing, and a local max at around $x = 8.5$ where the area function changes from increasing to decreasing.

c.