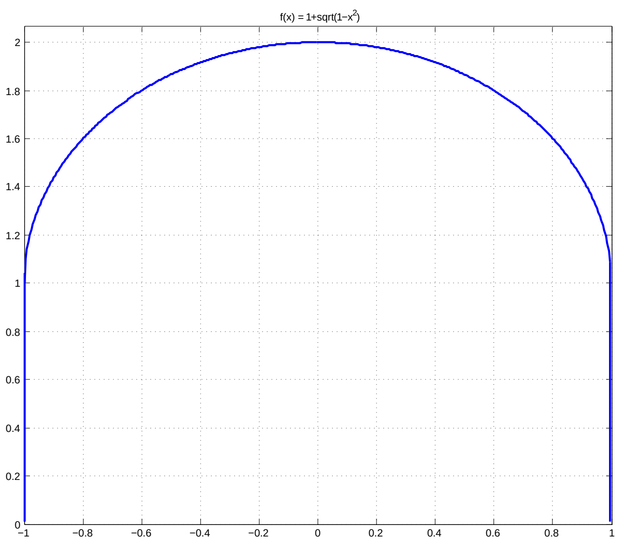
5.3: 2. $\int_{-1}^{0} 2x^3 dx$

5.3: 6. $\int_0^1 \sqrt{4-x^2}dx$

5.3: 14. (a) $\int_1^3 h(r)dr = \int_{-1}^{3} h(r)dr - \int_{-} 1^1 h(r)dr = 6 - 0 = 6$

(b) $-\int_3^1 h(u)du = -(-\int_1^3 h(u)du) = \int_1^3 h(u)du = 6$

5.3: 22. $y = 1+\sqrt{1-x^2} \Rightarrow y - 1 = \sqrt{1-x^2} \Rightarrow (y-1)^2 = 1 - x^2 \Rightarrow x^2 + (y-1)^2 = 1$, a circle with center $(0,\ 1)$ and radius of $1 \Rightarrow y = 1 + \sqrt{1-x^2}$ is the upper semicircle. The area of this semicircle is $A = 1/2 \cdot \pi r^2 = 1/2 \cdot \pi(1)^2 = \pi/2$. The area of the rectangular base is $A = lw = 2 \cdot 1 = 2$. Then the total area is $2 + \pi/2 \Rightarrow \int_{-1}^{1} \left(1+\sqrt{1-x^2}\right) dx = 2 + \pi/2$ square units.



5.3: 60.

$$
\begin{aligned}
av(f) &= \frac{1}{1-(-2)} \int_{-2}^{1} (t^2 - t)dt & (1)\\
&= \frac{1}{3}\int_{-2}^{1} t^2 dt - \frac{1}{3}\int_{-2}^{1} t dt & (2)\\
&= \frac{1}{3}\int_{0}^{1} t^2 dt - \frac{1}{3}\int_{-2}^{0} t^2 dt - \frac{1}{3}\left(1^2/2 - (-2)^2/2\right) & (3)\\
&= 1/3(1^3/3) - 1/3((-2)^3/3) + 1/2 = 3/2 & (4)
\end{aligned}
$$

5.4: 14. $\int_0^{\pi/3} 4\sec u \tan u du = [4\sec u]_0^{\pi/3} = 4\sec(\pi/3) - 4\sec 0 = 4(2) - 4(1) = 4$

5.4: 24. $\int_9^4 \frac{1-\sqrt{u}}{\sqrt{u}} du = \int_9^4 (u^{-1/2} - 1) du = [2\sqrt{u} - u]_9^4 = (2\sqrt{4} - 4) - (2\sqrt{9} - 9) = 3$

5.4: 28. (a) $\int_1^{\sin x} 3t^2 dt = [t^3]_1^{\sin x} = \sin^3 x - 1 \Rightarrow \frac{d}{dx}\left(\int_1^{\sin x} 3t^2 dt\right) = \frac{d}{dx}(\sin^3 x - 1) = 3\sin^2 x \cos x$

(b) $\frac{d}{dx}\left(\int_1^{\sin x} 3t^2 dt\right) = (3\sin^2 x)\frac{d}{dx}(\sin x) = 3\sin^2 x \cos x$

5.4: 30. (a) $\int_0^{\tan\theta} \sec^2 y dy = [\tan y]_0^{\tan\theta} - 0 = \tan(\tan\theta) \Rightarrow \frac{d}{d\theta}\left(\int_0^{\tan\theta} \sec^2 y dy\right) = \frac{d}{d\theta}(\tan(\tan\theta)) = (\sec^2(\tan\theta))\sec^2\theta$

(b) $\frac{d}{d\theta}\left(\int_0^{\tan\theta} \sec^2 y dy\right) = (\sec^2(\tan\theta))\frac{d}{d\theta}(\tan\theta) = (\sec^2(\tan\theta))\sec^2\theta$

5.4: 36. $y = \int_0^{\tan x} \frac{dt}{1+t^2} \Rightarrow \frac{dy}{dx} = \left(\frac{1}{1+\tan^2 x}\right)\left(\frac{d}{dx}(\tan x)\right) = (1/\sec^2 x)(\sec^2 x) = 1$

5.4: 43. The area of the rectangle bounded by the lines $y = 2$, $y = 0$, $x = \pi$, and $x = 0$ is 2π. The area under the curve $y = 1 + \cos x$ on $[0, \pi]$ is $\int_0^{\pi}(1 + \cos x)dx = [x + \sin x]_0^{\pi} = (\pi + \sin\pi) - (0 + \sin 0) = \pi$. Therefore the area of the shaded region is $2\pi - \pi = \pi$.