8.7: 12 a. $n = 8 \Rightarrow \Delta x = \frac{3}{8} \Rightarrow \frac{\Delta x}{2} = \frac{3}{16}$; $\Sigma \text{mf}(\theta_i) = 1(0)+2(0.09334)+2(0.18429)+2(0.27075)+2(0.3512)+2(0.42443)+2(0.49026)+2(0.58466)+1(0.6) = 5.3977 \Rightarrow T = \frac{3}{16}(5.3977) = 1.01207$

b. $n = 8 \Rightarrow \Delta x = \frac{3}{8} \Rightarrow \frac{\Delta x}{3} = \frac{1}{8}$; $\Sigma \text{mf}(\theta_i) = 1(0)+4(0.09334)+2(0.18429)+4(0.27075)+2(0.3512)+4(0.42443)+2(0.49026)+4(0.58466)+1(0.6) = 8.14406 \Rightarrow T = \frac{1}{8}(8.14406) = 1.01801$

c. Let $u = 16+\theta^2 \Rightarrow du = 2\theta d\theta \Rightarrow \frac{1}{2}du = \theta d\theta$; $\theta = 0 \Rightarrow u = 16$, $\theta = 3 \Rightarrow u = 16+3^2 = 25$; $\int_0^3 \frac{\theta}{\sqrt{16+\theta^2}}d\theta = \int_{16}^{25} \frac{1}{\sqrt{u}}(\frac{1}{2}du) = \frac{1}{2}\int_{16}^{25} u^{-1/2}du = \left[\frac{1}{2}\left(\frac{u^{1/2}}{\frac{1}{2}}\right)\right]_{16}^{25} = \sqrt{25}-\sqrt{16} = 1$; $\text{E}_T = \int_0^3 \frac{\theta}{\sqrt{16+\theta^2}}d\theta - T \approx 1 - 1.01207 = -0.01207$; $\text{Es} = \int_0^3 \frac{\theta}{\sqrt{16+\theta^2}}d\theta - S \approx 1 - 1.01801 = -0.01801$

8.7: 20 a. $M = 6$(see Exercise 6); Then $\Delta x = \frac{2}{n} \Rightarrow |\text{E}_T| \le \frac{2}{12}\left(\frac{2}{n}\right)^2(6) = \frac{4}{n^2} < 10^{-4} \Rightarrow n^2 > 4(10^4) \Rightarrow n > \sqrt{4(10^4)} = 200$, so let $n = 201$

b. $M = 0$(see Exercise 6); Then $n = 2$ (n must be even) $\Rightarrow \Delta x = 1 \Rightarrow |\text{E}_s| = \frac{2}{180}(1)^4(0) = 0 < 10^{-4}$

8.7: 26 a. $f(x) = \cos(x+\pi) \Rightarrow f'(x) = -\sin(x+\pi) \Rightarrow f''(x) = -\cos(x+\pi) \Rightarrow M = 1$. Then $\Delta x = \frac{2}{n} \Rightarrow |\text{E}_T| \le \frac{2}{12}(\frac{2}{n})^2(1) = \frac{8}{12n^2} < 10^{-4} \Rightarrow n^2 > \frac{8(10^4)}{12} \Rightarrow n > \sqrt{\frac{8(10^4)}{12}} \Rightarrow n > 81.6$, so let $n = 82$.

b. $f^{(3)}(x) = \sin(x+\pi) \Rightarrow f^{(4)}(x) = \cos(x+\pi) \Rightarrow M = 1$. Then $\Delta x = \frac{2}{n} \Rightarrow |\text{E}_s| \le \frac{2}{180}(\frac{2}{n})^4(1) = \frac{32}{180n^4} < 10^{-4} \Rightarrow n^4 > \frac{32(10^4)}{180} \Rightarrow n > \sqrt[4]{\frac{32(10^4)}{180}} \Rightarrow n > 6.49$, so let $n = 8$ (n must be even)

8.7: 28a Using Trapezoid Rule, $\Delta x = 200 \Rightarrow \frac{\Delta x}{2} = \frac{200}{2} = 100$; $\Sigma m f(x_i) = 13,180 \Rightarrow$ Area $\approx 100(13,180) = 1,318,000\text{ft}^2$. Since the average depth = 20ft, we obtain Volume ≈ 20(Area) $\approx 26,360,000\text{ft}^3$.

	x_i	$f(x_i)$	m	$mf(x_i)$
x_0	0	0	1	0
x_1	200	520	2	1040
x_2	400	800	2	1600
x_3	600	1000	2	2000
x_4	800	1140	2	2280
x_5	1000	1160	2	2320
x_6	1200	1110	2	2220
x_7	1400	860	2	1720
x_8	1600	0	2	0

8.7: 32 $\frac{24}{2}[0.019+2(0.020)+2(0.021)+\cdots+2(0.031)+0.035] = 4.2$ L

8.8: 6 $\int_{-8}^{1} \frac{dx}{x^{1/3}} = \int_{-8}^{0} \frac{dx}{x^{1/3}} + \int_0^1 \frac{dx}{x^{1/3}} = \lim_{b\to 0^-}[\frac{3}{2}x^{2/3}]_{-8}^{b} + \lim_{c\to 0^+}[\frac{3}{2}x^{2/3}]_e^1 = \lim_{b\to 0^-}[\frac{3}{2}b^{2/3} - \frac{3}{2}(-8)^{2/3}] + \lim_{c\to 0^+}[\frac{3}{2}(1)^{2/3} - \frac{3}{2}e^{2/3}] = [0 - \frac{3}{2}(4)] + (\frac{3}{2} - 0) = -\frac{9}{2}$

8.8: 24 $\int_{-\infty}^{\infty} 2xe^{-x^2}dx = \int_{-\infty}^{0} 2xe^{-x^2}dx + \int_0^{\infty} 2xe^{-x^2}dx = \lim_{b\to-\infty}[-e^{-x^2}]_b^0 + \lim_{c\to\infty}[-e^{-x^2}]_0^c = \lim_{b\to-\infty}[-1-(-e^{-b^2})] + \lim_{c\to\infty}[-e^{-c^2} - (-1)] = (-1-0)+(0+1) = 0$

8.8: 26 $\int_0^1(-\ln x)dx = \lim_{b\to 0^+}[x - x\ln x]_b^1 = [1 - 1\ln 1] - \lim_{b\to 0^+}[b - b\ln b] = 1 - 0 + \lim_{b\to 0^+}\frac{\ln b}{\frac{1}{b}} = 1 + \lim_{b\to 0^+}\frac{\frac{1}{b}}{-\frac{1}{b^2}} = 1 - \lim_{b\to 0^+} b = 1 - 0 = 1$

8.8: 30 $\int_2^4 \frac{dt}{t\sqrt{t^2-4}} = \lim_{b\to 2^+}[\frac{1}{2}\sec^{-1}\frac{t}{2}]_b^4 = \lim_{b\to 2^+}[(\frac{1}{2}\sec^{-1}\frac{4}{2}) - \frac{1}{2}\sec^{-1}(\frac{b}{2})] = \frac{1}{2}(\frac{\pi}{3}) - \frac{1}{2}\cdot 0 = \frac{\pi}{6}$

8.8: 52 $\int_2^\infty \frac{dx}{\sqrt{x^2-1}}$; $\lim_{x\to\infty} \frac{\left(\frac{1}{\sqrt{x^2-1}}\right)}{\frac{1}{x}} = \lim_{x\to\infty} \frac{x}{\sqrt{x^2-1}} = \lim_{x\to\infty} \frac{1}{\frac{1}{\sqrt{1-\frac{1}{x^2}}}} = 1$; $\int_2^\infty \frac{1}{x} dx = \lim_{b\to\infty} [\ln b]_2^b = \infty$, which diverges $\Rightarrow \int_2^\infty \frac{dx}{\sqrt{x^2-1}}$ diverges by Limit Comparison Test.

8.8: 54 $\int_2^\infty \frac{x dx}{\sqrt{x^4-1}}$; $\lim_{x\to\infty} \frac{\frac{x}{\sqrt{x^4-1}}}{\frac{x}{\sqrt{x^4}}} = \lim_{x\to\infty} \frac{\sqrt{x^4}}{\sqrt{x^4-1}} = \lim_{x\to\infty} \frac{1}{\sqrt{1-\frac{1}{x^4}}} = 1$; $\int_2^\infty \frac{x dx}{\sqrt{x^4}} = \int_2^\infty \frac{dx}{x} = \lim_{b\to\infty} [\ln x]_2^b = \infty$, which diverges $\Rightarrow \int_2^\infty \frac{x dx}{\sqrt{x^4-1}}$ diverges by Limit Comparison Test.

8.8: 58 $\int_2^\infty \frac{dx}{\ln x}$; $0 < \frac{1}{x} < \frac{1}{\ln x}$ for $x > 2$ and $\int_2^\infty \frac{dx}{x}$ diverges $\Rightarrow \int_2^\infty \frac{dx}{\ln x}$ diverges by Direct Comparison Test.

8.8: 64 $\int_{-\infty}^\infty \frac{dx}{e^x+e^{-x}} = 2\int_0^\infty \frac{dx}{e^x+e^{-x}}$; $0 < \frac{1}{e^x+e^{-x}} < \frac{1}{e^x}$ for $x > 0$; $\int_0^\infty \frac{dx}{e^x}$ converges $\Rightarrow 2\int_0^\infty \frac{dx}{e^x+e^{-x}}$ converges by Direct Comparison Test.