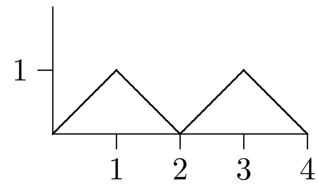
7.7, #16. The statement is true. y^2-1 is concave-up on $[0,1]$ since the graph of (y^2-1) is a parabola opening upwards. Thus the midpoint rule underestimates $\int_0^1 (y^2-1)\,dy$.

7.7, #17. The statement is false. The trapezoid rule is exact whenever the graph of $f(x)$ is a line.

7.7, #18. The statement is false. It can happen that LEFT(4)$\geq \int_a^b f(x)\,dx$ if $f(x)$ is not monotonic on $[a,b]$. For example, let f be the saw-tooth function



Then LEFT(2)$=0$, whereas LEFT(4)$=\int_0^4 f(x)\,dx = 2$.

7.7, #19. The statement is true. The magnitude of the error in using left or right sums depend on the magnitude of the first derivative.

7.8, #2. $\displaystyle\int_1^b \frac{x}{4+x^2}\,dx = \frac{1}{2}\ln(4+x^2)\Big|_1^b = (1/2)(\ln(4+b^2)-\ln 5)$ goes to infinity as $b\to\infty$. Thus the improper integral diverges.

7.8, #3. $\displaystyle\int_0^b e^{-x}x\,dx = e^{-x}(-1-x)\Big|_0^b = e^{-b}(-1-b)+1$. This has limit 1 as $b\to\infty$ since e^{-b} goes to zero much faster than $-1-b$ goes to $-\infty$. Thus the improper integral converges.

7.8, #4. $\displaystyle\int_b^0 \frac{e^x}{1+e^x}\,dx = \ln(1+e^x)\Big|_b^0 = \ln 2 - \ln(1+e^b)$. This has limit $\ln 2$ as $b\to-\infty$.