Approximate Integration: Examples

1. If $f'(x) < 0$ and $f''(x) > 0$ for $a \leq x \leq b$, order L_n, R_n, M_n and T_n where L_n is the left endpoint approximation, R_n is the right endpoint approximation, M_n is the midpoint rule, and T_n is the trapezoidal rule each using n subdivisions.

2. If $f'(x) > 0$ and $f''(x) < 0$ for $a \leq x \leq b$, place the following in increasing order: L_n, R_n, M_n and T_n, where L_n is the approximation of the integral using n subdivisions and the left end point, R_n uses the right end point, M_n uses the Midpoint Rule, T_n uses the Trapezoidal Rule.

3. For $\displaystyle\int_0^8 \sin(x^2)dx$, find R_4, L_4, M_4, T_4 and S_4.

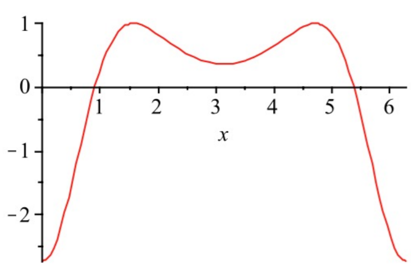
4. If $f(x)$ is a continuous function on the interval $0 \leq x \leq 2$ and $f(0) = 1.5$, $f(0.5) = 1.75$, $f(1) = 1.5$, $f(1.5) = 1.25$, $f(2) = 2.5$, estimate $\displaystyle\int_0^2 f(x)dx$ by finding L_4, R_4, T_4, M_2, and S_4.

5. Use the integral definition of $\ln 2$ and the midpoint rule with $n = 2$ to approximate $\ln 2$.

6. For $\displaystyle\int_0^{3\pi} \sin(x)dx$, which of the following would give the most accurate approximation: T_3, M_3, R_3, L_3?

7. Use the trapezoidal rule with $n = 2$ to approximate $\displaystyle\int_{-1}^3 x^4 dx$

8. The graph for $f''(x)$ is given below for $0 \leq x \leq 2\pi$. Is the error for the approximation M_{100} of $\displaystyle\int_0^{2\pi} f(x)dx$ less than 0.005? Justify your conclusion.



9. Use the following table of values and Simpson's Rule with $n = 4$ to estimate $\displaystyle\int_0^2 f(x)\,dx$

x	0.0	0.5	1.0	1.5	2.0
$f(x)$	2.5	2.8	3.0	3.2	3.5

10. Simpson's rule with n subdivisions, where n is even, is used to approximate the integral $\displaystyle\int_0^{\pi/2} \sin(2x)dx$. If E_S is the error in using Simpson's Rule, what is the correct upper bound for $|E_S|$?