In the following problems L_n represents a left endpoint approximation, R_n represents a right endpoint approximation, M_n represents a midpoint approximation, T_n represents a trapezoidal approximation, and S_n represents a Simpson's approximation where n is the number of subintervals.

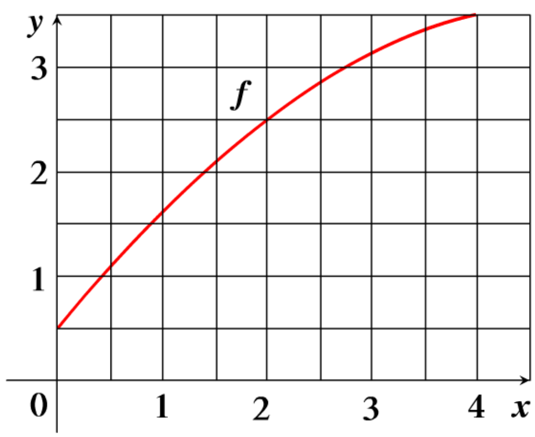
1) Let $I = \int_0^4 f(x)\,dx$, where f is the function whose graph is shown.

a) Use the graph to find L_2, R_2, and M_2. $\boxed{L_2 = 6,\ R_2 = 12,\ M_2 \approx 9.6}$

b) Are these underestimates or overestimates of I? $\boxed{L_2 = \text{under},\ R_2 = \text{over},\ M_2 = \text{over}}$

c) Use the graph to find T_2. How does it compare with I? $\boxed{T_2 = 9,\ \text{under}}$

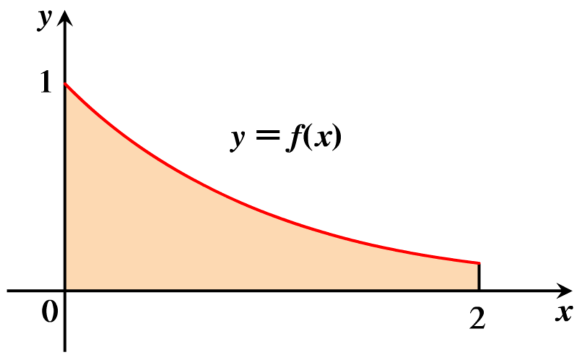
d) For any value of n, list the numbers L_n, R_n, M_n, T_n, and I in increasing order. $\boxed{L_n < T_n < I < M_n < R_n}$



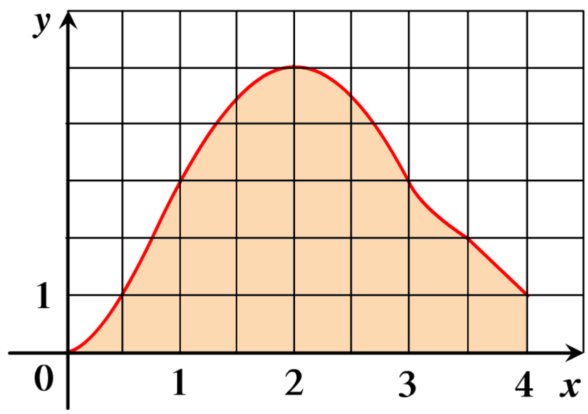
2) The left, right, Trapezoidal, and Midpoint Rule approximations were used to estimate $\int_0^2 f(x)\,dx$, where f is the function whose graph is shown. The estimates were 0.7811, 0.8675, 0.8632, and 0.9540, and the same number of subintervals were used in each case.

a) Which rule produced which estimate? $\boxed{L_n = 0.9540,\ T_n = 0.8675,\ M_n = 0.8632,\ R_n = 0.7811}$

b) Between which two approximations does the true value of $\int_0^2 f(x)\,dx$ lie? $\boxed{0.8632 < \int_0^2 f(x)\,dx < 0.8675}$



3) Estimate the area under the graph in the figure by using the Trapezoidal Rule, the Midpoint Rule, and Simpson's Rule, each with $n = 4$.



$$\boxed{T_4 \approx 11.5,\ M_4 \approx 12,\ S_4 \approx 11.\overline{6}}$$

4) Estimate $\int_0^1 \cos(x^2)\,dx$ using the Trapezoidal Rule and the Midpoint Rule, each with $n = 4$. From a graph of the integrand, decide whether your answers are underestimates or overestimates. Between which two approximations does the true value of $\int_0^1 \cos(x^2)\,dx$ lie?

$$\boxed{\begin{array}{l} T_4 \approx 0.895759,\ M_4 \approx 0.908907 \\ T_4 = \text{under},\ M_4 = \text{over} \\ 0.895759 < \int_0^1 \cos(x^2)\,dx < 0.908907 \end{array}}$$

Use the Trapezoidal Rule, the Midpoint Rule, and Simpson's Rule to approximate the given integral with the specified value of n. (Round your answers to six decimal places.)

5) $\int_0^{1/2} \sin(x^2)\,dx, \quad n=4$ $\boxed{T_4 \approx 0.042743,\ M_4 \approx 0.040850,\ S_4 \approx 0.041478}$

6) $\int_1^2 e^{1/x}\,dx, \quad n=4$ $\boxed{T_4 \approx 2.031893,\ M_4 \approx 2.014207,\ S_4 \approx 2.020651}$

7) $\int_0^3 \frac{1}{1+y^5}\,dy, \quad n=6$ $\boxed{T_6 \approx 1.064275,\ M_6 \approx 1.067416,\ S_6 \approx 1.074915}$

8) For the integral $\int_0^2 e^{-x^2}\,dx$ find the following:

a) Approximations T_{10} and M_{10}. $\boxed{T_{10} \approx 0.881839,\ M_{10} \approx 0.882202}$

b) Estimate the errors in the approximations of part a). $\boxed{|E_T| \le 0.01\overline{3},\ |E_M| \le 0.00\overline{6}}$

c) How large do we have to choose n so that the approximations T_n and M_n to the integral in part a) are accurate to within 0.00001? $\boxed{n = 366 \text{ for } T_n,\ n = 259 \text{ for } M_n}$

9) Use the following data to answer the following:

x	$f(x)$
0.0	6.8
0.4	6.5
0.8	6.3
1.2	6.4
1.6	6.9
2.0	7.6
2.4	8.4
2.8	8.8
3.2	9.0

a) Use the Midpoint Rule to estimate the value of the integral $\int_0^{3.2} f(x)\,dx$. $\boxed{M_4 \approx 23.44}$

b) If it is known that $-4 \le f''(x) \le 1$ for all x, estimate the error involved in the approximation in part a).
$\boxed{|E_M| \le 0.341\overline{3}}$