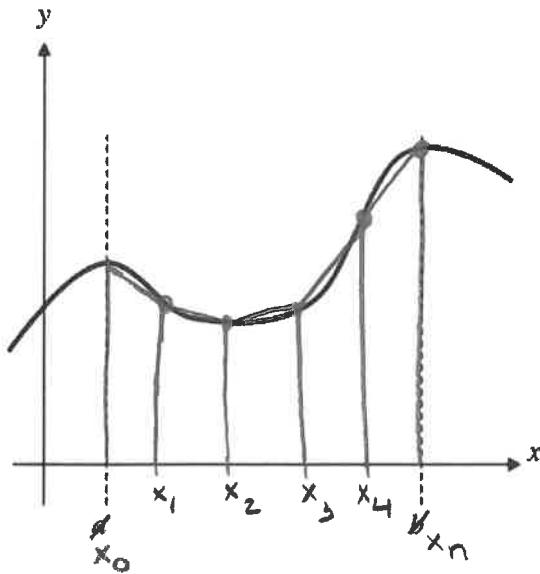


Trapezoidal Rule:

$$A = \frac{1}{2} h (f(x_0) + f(x_1)) + \frac{1}{2} h (f(x_1) + f(x_2)) + \dots + \frac{1}{2} h (f(x_{n-1}) + f(x_n))$$

$$h = \frac{b-a}{n} \quad \text{if equal subintervals}$$

OR $\frac{\text{LRAM} + \text{RRAM}}{2}$

1. The table below gives the level of a person's cholesterol at different times during a 10-week treatment period. What is the average level over this 10-week period obtained by using a trapezoidal approximation using the subintervals [0, 2], [2, 6], and [6, 10]?

Time (weeks)	0	2	6	10
Level	210	200	190	180

$$\begin{aligned} & \frac{1}{2}(2)(210+200) + \frac{1}{2}(4)(200+190) \\ & + \frac{1}{2}(4)(190+180) \end{aligned}$$

$$= 1930$$

2. Use the function values in the following table and the trapezoidal rule with $n = 6$ to

approximate $\int_2^8 f(x) dx$.

x	2	3	4	5	6	7	8
f(x)	16	19	17	14	13	16	20

$$\begin{aligned} \int_2^8 f(x) dx & \approx \frac{1}{2}(1)(16+19) + \frac{1}{2}(1)(19+17) + \frac{1}{2}(1)(17+14) + \frac{1}{2}(1)(14+13) \\ & + \frac{1}{2}(1)(13+16) + \frac{1}{2}(1)(16+20) \end{aligned}$$

$$= 97$$

AB Calculus
6.5 Trapezoidal Rule

3. The function f is continuous on the closed interval $[0, 6]$ and has the values given in the table above. The trapezoidal approximation for $\int_0^6 f(x)dx$ found with 3 subintervals of equal length is 52. What is the value of k ?

x	0	2	4	6
$f(x)$	4	k	8	12

$$52 = \frac{1}{2}(2)(4+k) + \frac{1}{2}(2)(k+8) + \frac{1}{2}(2)(8+12)$$

$$52 = 4+k + k+8 + 20$$

$$52 = 32 + 2k$$

$$20 = 2k$$

$10 = k$

5. Use the trapezoidal rule with $n = 4$ to approximate the value of $\int_1^2 \frac{1}{x} dx$. Use the concavity of the function to predict whether the approximation is an overestimate or an underestimate. Find the integrals exact value to check your answer.

$$\frac{2-1}{4} = \frac{1}{4}$$

$$\int_1^2 \frac{1}{x} dx \approx \frac{1}{2}\left(\frac{1}{4}\right)\left(\frac{1}{1} + \frac{1}{5/4}\right) + \frac{1}{2}\left(\frac{1}{4}\right)\left(\frac{1}{5/4} + \frac{1}{6/4}\right) + \frac{1}{2}\left(\frac{1}{4}\right)\left(\frac{1}{6/4} + \frac{1}{7/4}\right) + \frac{1}{2}\left(\frac{1}{4}\right)\left(\frac{1}{7/4} + \frac{1}{2}\right)$$

$$= \frac{1}{8} \left[1 + \frac{1}{5} + \frac{1}{5} + \frac{1}{6} + \frac{1}{6} + \frac{1}{7} + \frac{1}{7} + \frac{1}{2} \right]$$

$$= 0.697$$