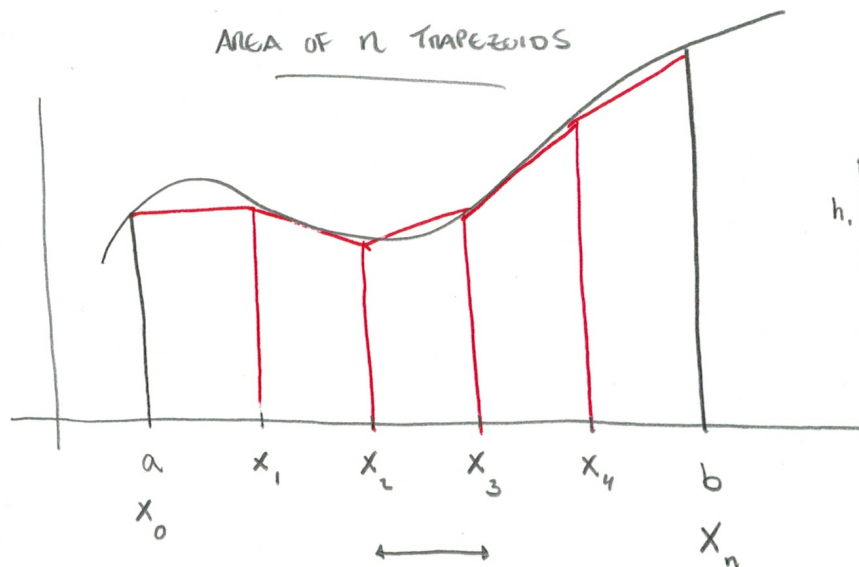


§ 8.7 NUMERICAL INTEGRATION

TRAPEZOID RULE:

AREA OF n TRAPEZOIDS



$$A = \frac{1}{2} (h_1 + h_2) b$$

$$\Delta x = \frac{b-a}{n}$$

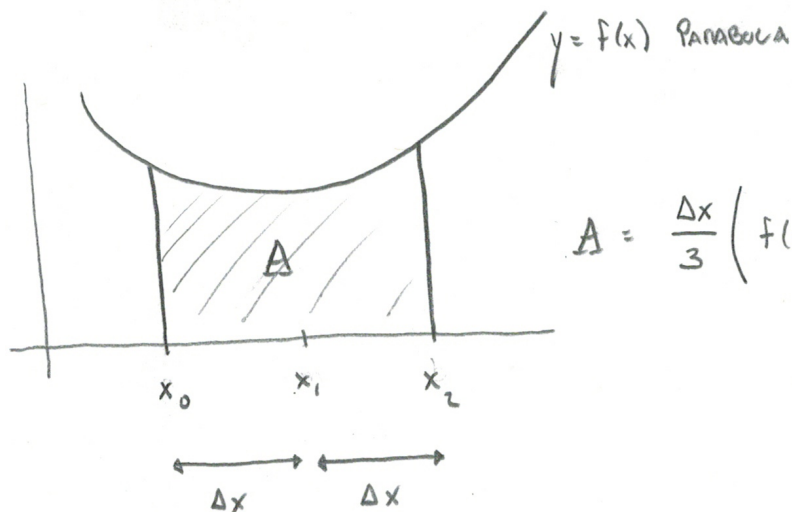
$$T = \frac{1}{2} (f(x_0) + f(x_1)) \Delta x + \frac{1}{2} (f(x_1) + f(x_2)) \Delta x + \dots + \frac{1}{2} (f(x_{n-1}) + f(x_n)) \Delta x$$

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

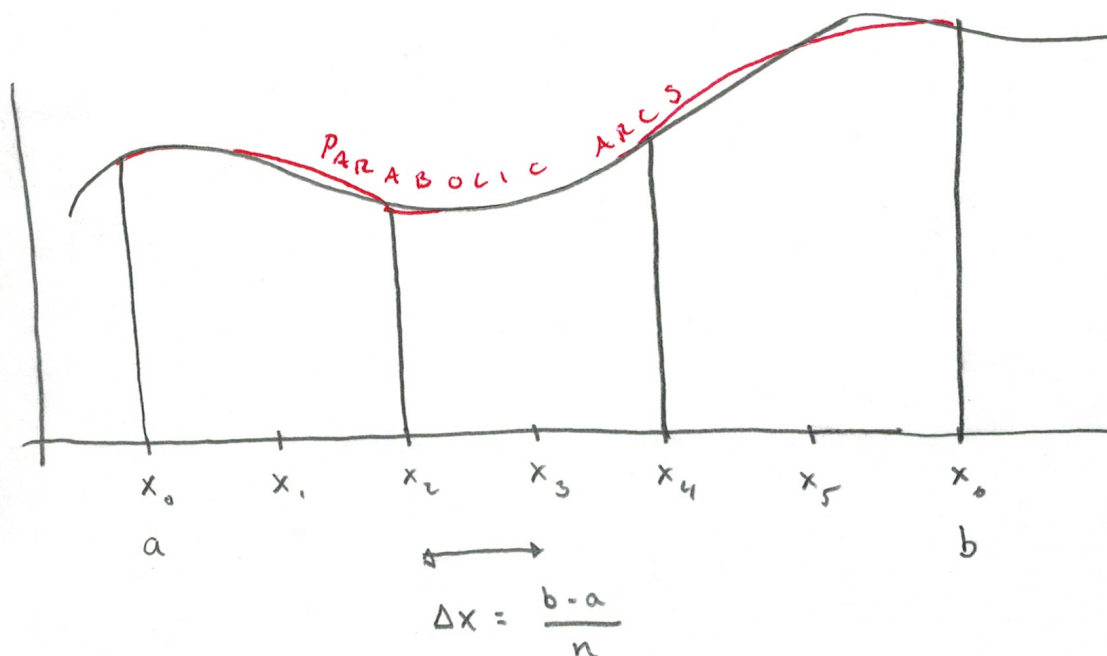
ex. $\int_1^2 \frac{1}{x^2} dx, n=4$

ex. $\int_0^{\pi/2} \sin x dx, n=3$

SIMPSON'S RULE:



(n even)



$$S = \frac{\Delta x}{3} (f(x_0) + 4f(x_1) + f(x_2)) + \frac{\Delta x}{3} (f(x_2) + 4f(x_3) + f(x_4)) + \dots$$

$$+ \frac{\Delta x}{3} (f(x_{n-2}) + 4f(x_{n-1}) + f(x_n))$$

$$S = \frac{\Delta x}{3} \left(f(x_0) + 4f(x_1) + 2f(x_2) + 4f(x_3) + 2f(x_4) + \dots + 4f(x_{n-1}) + f(x_n) \right)$$

1 (4, 2, 4, 2, ..., 2, 4) 1