SECTION 10

Trapezoidal Rule for Approximation

- How can we approximate the area under the curve using trapezoids?
- How is summation notation used to approximate the area under the curve?

REVIEW: AREA OF A TRAPEZOID

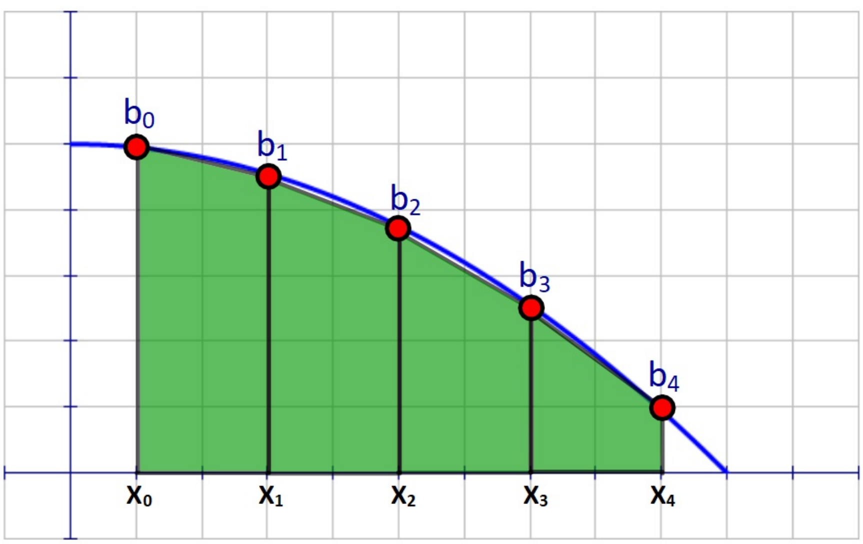
$$A = \frac{b_1 + b_2}{2} \cdot h$$

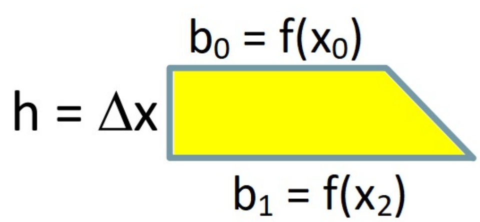
b_1 & b_2	**Bases of the trapezoid**
h	**Height of the trapezoid**

TRAPEZOIDAL RULE

$h = \Delta x$

$b_0, b_1, \ldots = f(x_1), f(x_2)\ldots$





TRAPEZOIDAL RULE

$$A = \frac{\Delta x}{2}[f(x_1) + f(x_2)] + \frac{\Delta x}{2}[f(x_2) + f(x_3)] + \frac{\Delta x}{2}[f(x_3) + f(x_4)] + \frac{\Delta x}{2}[f(x_4) + f(x_5)]$$

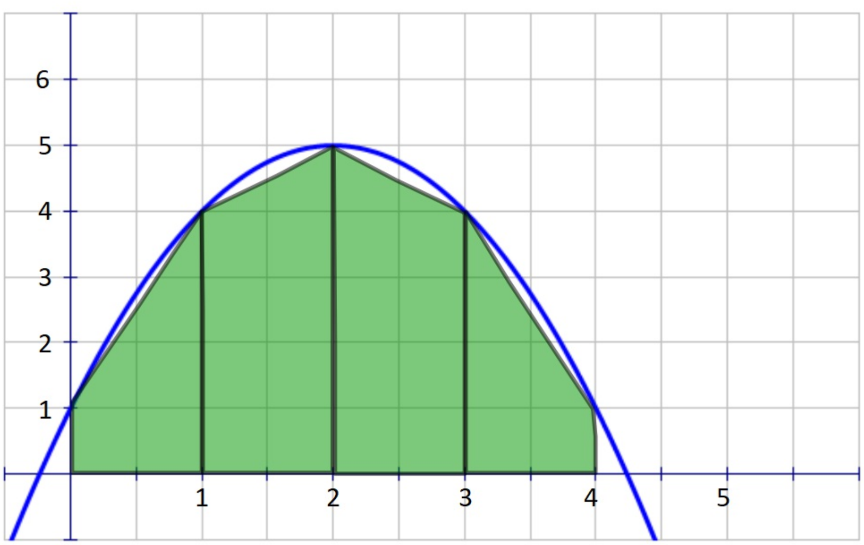
$$A = \frac{\Delta x}{2}[f(x_1) + f(x_2) + f(x_2) + f(x_3) + f(x_3) + f(x_4) + f(x_4) + f(x_5)]$$

$$A = \frac{\Delta x}{2}[f(x_1) + 2f(x_2) + 2f(x_3) + 2f(x_4) + f(x_5)]$$

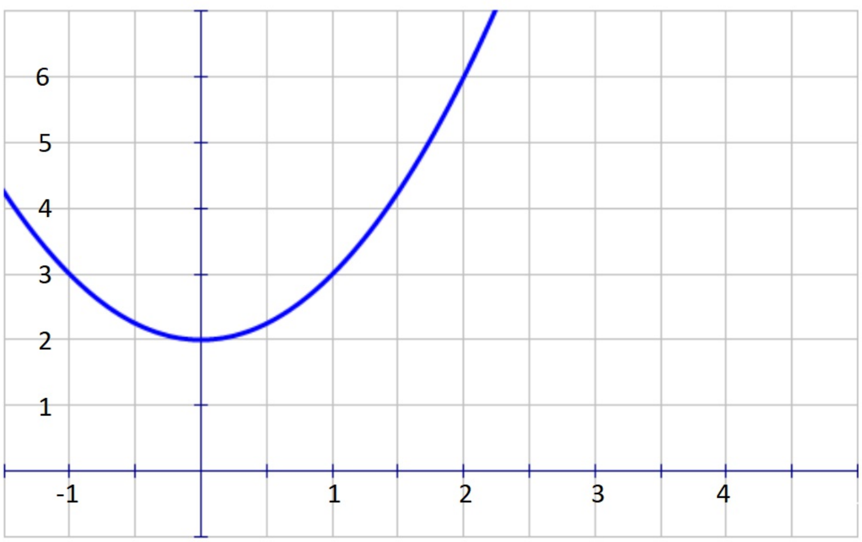
Generalize to any *n*, where *n* is the number of trapezoids.

$$\boldsymbol{A = \frac{\Delta x}{2}[f(x_1) + 2f(x_2) + \cdots + 2f(x_n) + f(x_{n+1})]}$$

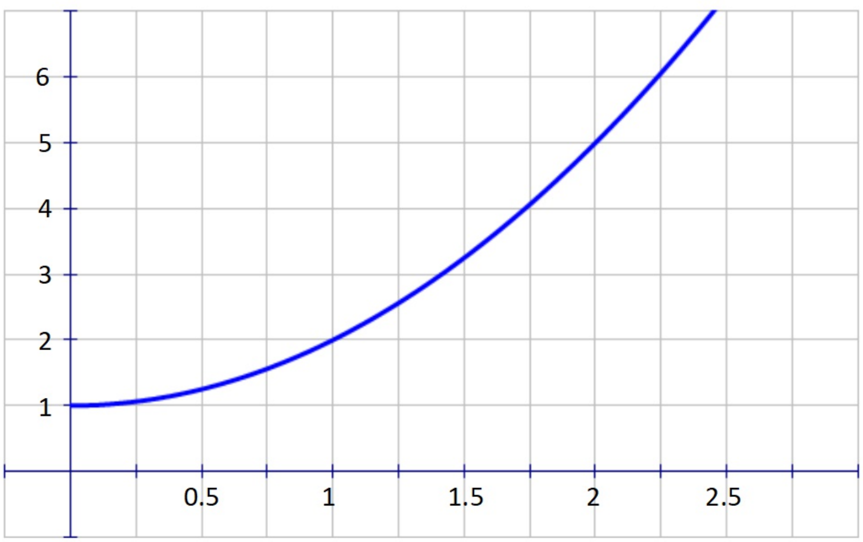
EXAMPLE 1: $f(x) = -x^2 + 4x\ 1$ [0, 4] n = 4

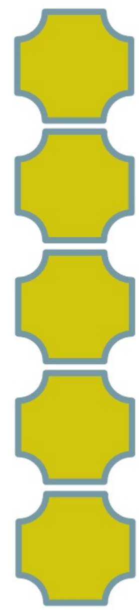


EXAMPLE 2: $f(x) = x^2 + 2$ $[-1, 2]$ $n = 3$



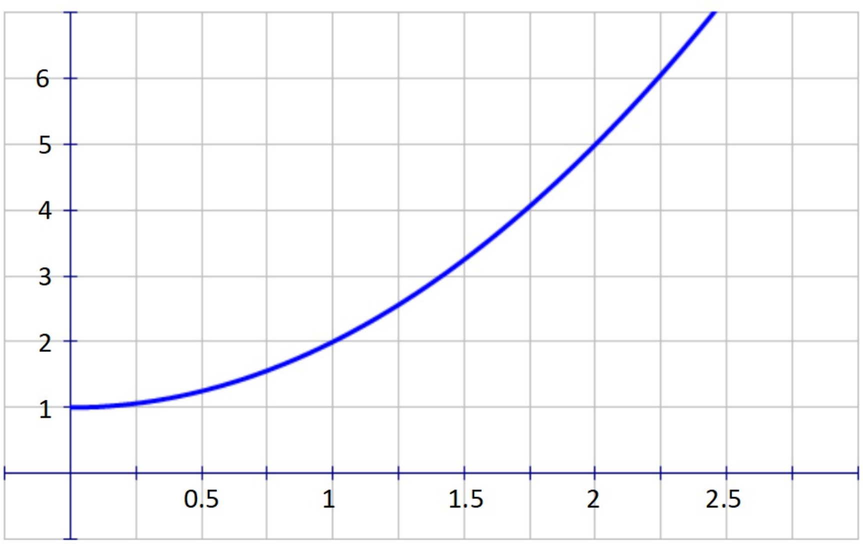
EXAMPLE 3: $f(x) = x^2 + 1$ [0, 2] n = 4





APPROXIMATION SUMMARY

LRAM vs RRAM vs MRAM vs Trapezoidal Rule



SELF CHECK: Trapezoidal Rule

- ☑ How can we approximate the area under the curve using trapezoids?
- ☑ How is summation notation used to approximate the area under the curve?