November 2, 2026

National Ohio Day

Today in History:

Truman defeats Dewey (1948)

MLK Federal Holiday declared (1983)

Number of the Day: 884

884 = 2 x 2 x 13 x 17

884 is 202 in base 21.

Fun Fact:

99% of the pumpkins sold in the US end up as jack-o-lanterns.

Quote of the Day:

"When I die, I want to die like my grandfather who died peacefully in his sleep. Not screaming like all the passengers in his car."

- Will Rogers

Today's Weather:

Generally cloudy, high of 63^{o}.

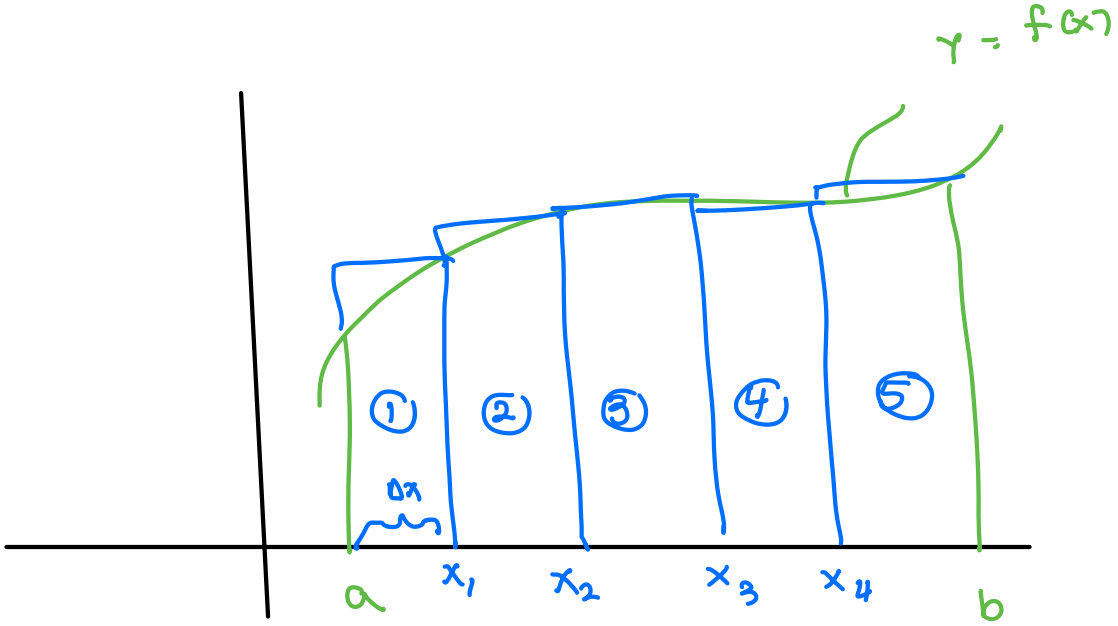
Math 121 - Quiz #33

Find x_1 using Newton's Method if

$$x_0 = 2 \qquad f(2) = -1 \qquad f'(2) = 4$$

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

$$= 2 - \frac{-1}{4} = 2.25$$



N SUB-INTERVALS $\qquad \Delta x = \frac{b-a}{N}$

$A_1 = \Delta x \, f(x_1) \qquad A_2 = \Delta x \, f(x_2)$

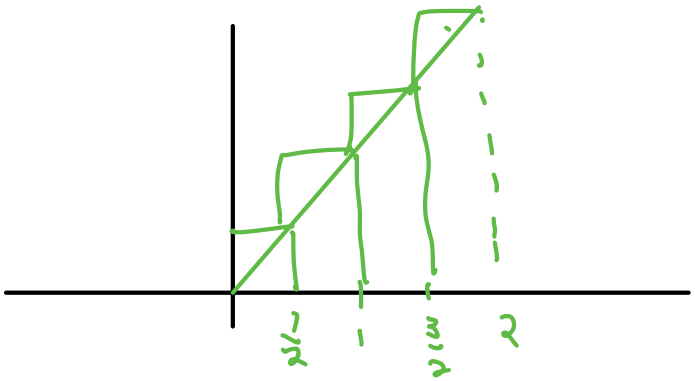
$A_3 = \Delta x\, f(x_3)$ $\quad A_4 = \Delta x\, f(x_4)$

$A_5 = \Delta x\, f(b)$

$$A \approx \left(f(x_1) + f(x_2) + f(x_3) + f(x_4) + f(b) \right) \Delta x$$

EXAMPLE $\quad f(x) = 2x \quad [0,2] \quad N = 4$

$$\Delta x = \frac{b-a}{N} = \frac{2-0}{4} = \frac{1}{2}$$

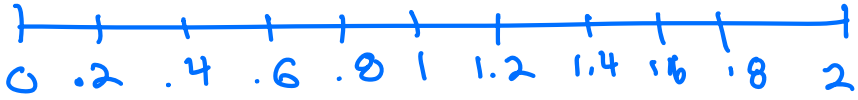


$$A \approx \left(f(\tfrac{1}{2}) + f(1) + f(\tfrac{3}{2}) + f(2) \right)\left(\tfrac{1}{2}\right)$$

$$= \left(1 + 2 + 3 + 4\right)\left(\tfrac{1}{2}\right) = 5$$

$f(x) = 2x \quad [0,2] \quad N = 10$

$$\Delta x = \frac{b-a}{N} = \frac{2-0}{10} = .2$$



$$A \approx \left(f(.2) + f(.4) + f(.6) + f(.8) + f(1) + f(1.2) + f(1.4) + f(1.6) + f(1.8) + f(2) \right).2$$

$$= (4 + .8 + 1.2 + 1.6 + 2 + 2.4 + 2.8 + 3.2 + 3.6 + 4)(.2)$$

Sigma Notation

$$a_1 + a_2 + a_3 + a_4 + \cdots + a_N = \sum_{j=1}^{N} a_j$$

$$\sum_{j=1}^{5} 2j = 2 + 4 + 6 + 8 + 10$$

$$\sum_{j=1}^{3} j^3 = 1 + 8 + 27$$

Rules

1. $$\sum_{j=1}^{N} (a_j + b_j) = \sum_{j=1}^{N} a_j + \sum_{j=1}^{N} b_j$$

2. $$\sum_{j=1}^{N} c\, a_j = c \sum_{j=1}^{N} a_j$$

3. $$\sum_{j=1}^{N} c = \overbrace{c + c + c + c + \cdots + c}^{N} = cN$$

4. $$\sum_{j=1}^{N} j = 1 + 2 + 3 + 4 + \cdots N = \frac{N(N+1)}{2}$$

$$\sum_{j=1}^{10} j = 1 + 2 + 3 + \cdots + 10 = \frac{10(11)}{2} = 55$$

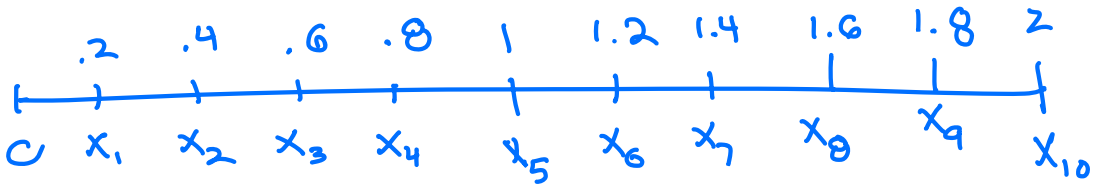
5. $$\sum_{j=1}^{N} j^2 = 1 + 4 + 9 + \cdots N^2 = \frac{N(N+1)(2N+1)}{6}$$

$$\sum_{j=1}^{4} j^2 = 1 + 4 + 9 + 16 = \frac{4(5)(9)}{6}$$

$$= 30$$

(6) $\sum_{j=1}^{N} j^3 = 1 + 8 + 27 + \cdots N^3 = \left[\frac{N(N+1)}{2}\right]^2$

$f(x) = 2x \qquad [0,2] \qquad N = 10$



$x_1 = 0 + 1\Delta x = a + \Delta x$

$x_2 = 0 + 2\Delta x = a + 2\Delta x$

$x_j = a + j\Delta x$

$$\Delta x \sum_{j=1}^{10} f(x_j)\,\Delta x = \sum_{j=1}^{10} f(0 + j\Delta x)\,\Delta x$$

$$= \sum_{j=1}^{10} 2(j[.2])[.2]$$

$$= \sum_{j=1}^{10} (.08)\,j = .08 \sum_{j=1}^{10} j$$

$$(.08)\left(\frac{10(11)}{2}\right) = 4.4$$

$f(x) = 2x \qquad [0,2] \qquad N = 100$

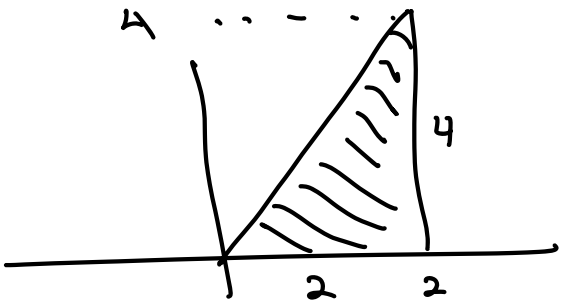
$$\Delta x = \frac{b-a}{N} = \frac{2-0}{100} = .02$$

$$x_j = a + j\,\Delta x = 0 + j\,(.02)$$

$$A \approx \sum_{j=1}^{100} f(x_j)\,\Delta x = \sum_{j=1}^{100} f(j(.02))(.02)$$

$$= \sum_{j=1}^{100} 2j\,(.02)(.02) = (2)(.02)(.02)\sum_{j=1}^{100} j$$

$$(2)(.02)(.02)\,\frac{(100)(101)}{2} = 4.04$$



$A = 4$

$f(x) = 2x \qquad [0,2] \qquad N$

$$\Delta x = \frac{b-a}{N} = \frac{2-0}{N} = \frac{2}{N}$$

$$x_j = a + j\,\Delta x = 0 + j\left(\frac{2}{N}\right) = \frac{2j}{N}$$

$$A \approx \sum_{j=1}^{N} f(x_j)\,\Delta x = \sum_{j=1}^{N} 2\left(\frac{2j}{N}\right)\left(\frac{2}{N}\right)$$

$$= \frac{8}{N^2}\sum_{j=1}^{N} j = \frac{8}{N^2}\,\frac{N(N+1)}{2} = \frac{4(N+1)}{N}$$

$$\lim_{N\to\infty} \frac{4(N+1)}{N} = 4$$

$f(x) = x^2 \qquad [0,2] \qquad N\text{-SUB.}$

$$\Delta x = \frac{b-a}{N} = \frac{2-0}{N} = \frac{2}{N}$$

$$x_j = a + j\,\Delta x = 0 + j\left(\frac{2}{N}\right) = \frac{2j}{N}$$

$$A \approx \sum_{j=1}^{N} f(x_j)\,\Delta x = \sum_{j=1}^{N} f\left(\frac{2j}{N}\right)\left(\frac{2}{N}\right)$$

$$= \sum_{j=1}^{N} \left(\frac{2j}{N}\right)^2 \left(\frac{2}{N}\right)$$

$$= \sum_{j=1}^{N} \frac{8j^2}{N^3} = \frac{8}{N^3} \sum_{j=1}^{N} j^2$$

$$\frac{8}{N^3}\left(\frac{N(N+1)(2N+1)}{6}\right)$$

$$\lim_{N\to\infty} \frac{8}{N^3}\left(\frac{N(N+1)(2N+1)}{6}\right) = \frac{16}{6} = \frac{8}{3}$$

$f(x) = x^2 \qquad [0, b] \qquad N\text{-SUB.}$

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

$$x_j = a + j\,\Delta x = 0 + j\left(\frac{b}{N}\right) = \frac{jb}{N}$$

$$A \approx \sum_{j=1}^{N} f(x_j)\,\Delta x = \sum_{j=1}^{N} f\left(\frac{jb}{N}\right)\frac{b}{N}$$

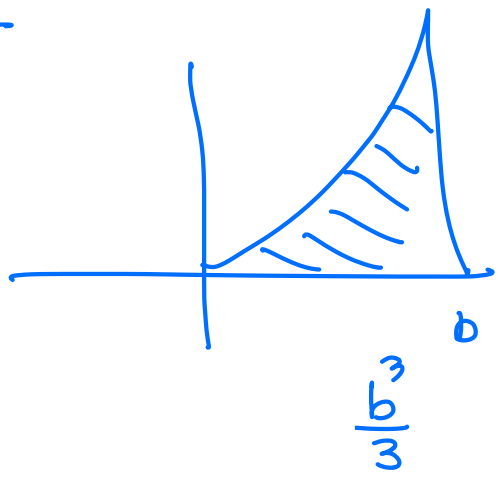
$$= \sum_{j=1}^{N} \left(\frac{j^2 b^2}{N^2}\right)\frac{b}{N} = \frac{b^3}{N^3}\sum_{j=1}^{N} j^2$$

$$= \frac{b^3}{N^3}\,\frac{N(N+1)(2N+1)}{6}$$

$$\lim_{N\to\infty} \frac{b^3}{N^3}\left(\frac{N(N+1)(2N+1)}{6}\right) = \frac{b^3\,2}{6}$$

$$= \frac{b^3}{3}$$

$f(x) = x^2$



$$A = \lim_{N\to\infty} \sum_{j=1}^{N} f(x_j)\,\Delta x$$

RIEMANN SUM.