

$$f(x) = x^2 + 4x + 2$$

$$a = 0$$

$$b = 4$$

$$\int_0^4 (x^2 + 4x + 2) dx$$

$$\int_a^b f(x) dx = \lim_{n \rightarrow \infty} \sum_{k=1}^n f(a + k \Delta x) \Delta x$$

Calculamos Δx
El ancho de cada subintervalo es

$$\Delta x = \frac{b-a}{n} = \frac{4-0}{n} = \frac{4}{n}$$

Calculamos f
 $f\left(0 + k\left(\frac{4}{n}\right)\right) = f\left(0 + \frac{4k}{n}\right)$

$$f = \frac{4k}{n}$$

Calculamos la función

$$f\left(\frac{4k}{n}\right) = \left(\frac{4k}{n}\right)^2 + 4\left(\frac{4k}{n}\right) + 2$$

Calculamos cada parte

$$\left(\frac{4k}{n}\right)^2 = \frac{16k^2}{n^2}$$

$$4 \cdot \frac{4k}{n} = \frac{16k}{n}$$

$$f\left(\frac{4k}{n}\right) = \frac{16k^2}{n^2} + \frac{16k}{n} + 2$$

Calculamos en la suma de Riemann

$$\sum_{k=1}^n f\left(\frac{4k}{n}\right) \cdot \Delta x = \sum_{k=1}^n \left(\frac{16k^2}{n^2} + \frac{16k}{n} \right)$$

multiplicamos

$$\sum_{k=1}^n \left(\frac{64k^2}{n^3} + \frac{64k}{n^2} + \frac{2}{1} \right)$$

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UDS

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sona Riemann

Soponos

$$\frac{64}{n^3} \sum_{k=1}^n k^2 + \frac{64}{n^2} \sum_{k=1}^n k + \sum_{k=1}^n \frac{8}{n}$$

Aplicamos sonas

$$\sum_{k=1}^n k^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum_{k=1}^n k = \frac{n(n+1)}{2}$$

$$\sum_{k=1}^n \frac{8}{n} = \frac{8}{n} \cdot n = 8$$

$$\frac{64}{n^3} \cdot \frac{n(n+1)(2n+1)}{6} + \frac{64}{n^2} \cdot \frac{n(n+1)}{2} + 8$$

Limite cuando $n \rightarrow \infty$

$$\lim_{n \rightarrow \infty} \frac{64n(n+1)(2n+1)}{6n^3} = \frac{64 \cdot 1 \cdot 2}{6} = \frac{128}{6} = \frac{64}{3}$$

$$\lim_{n \rightarrow \infty} \frac{32(n+1)}{1} = 1 \cdot n \rightarrow 8 \cdot 32 \left(1 + \frac{1}{2}\right) = 32$$

$$\lim_{n \rightarrow \infty} 8 = 8$$

Sonamos todo lo anterior

$$\frac{64}{3} + 32 + 8 = \frac{64}{3} + \frac{40}{1} = \frac{120 + 64}{3} = \frac{184}{3}$$

Resultado final