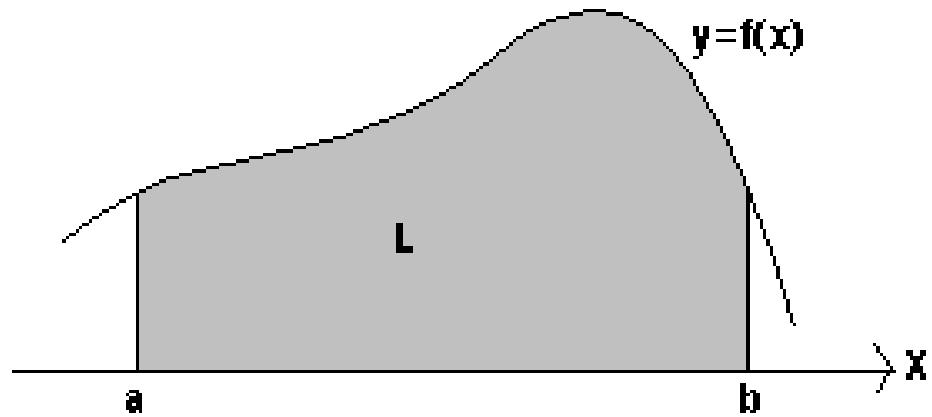


# INTEGRASI NUMERIK

- Luas daerah yang diarsir L dapat dihitung dengan :

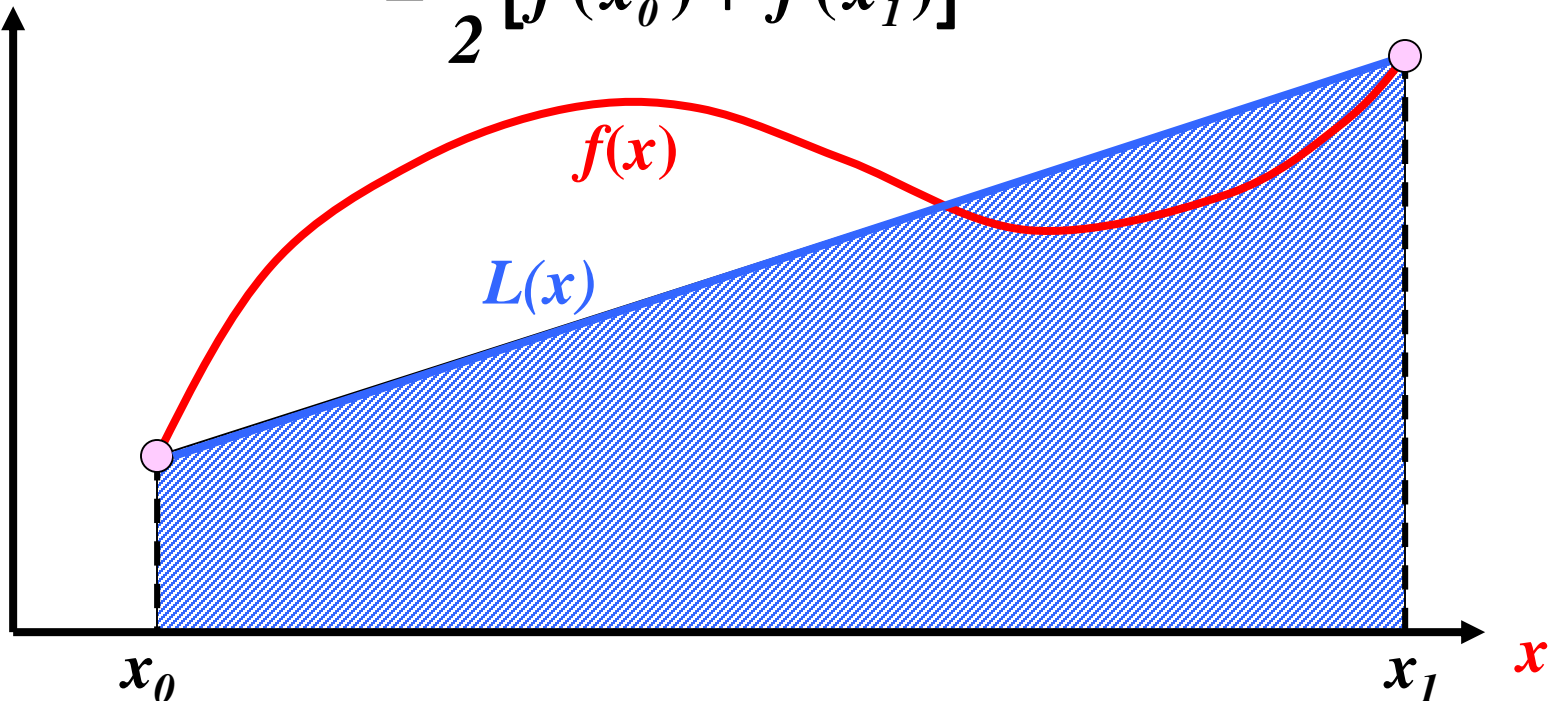
- $L = \int_a^b f(x) dx$



# Metode Integrasi Trapezoida

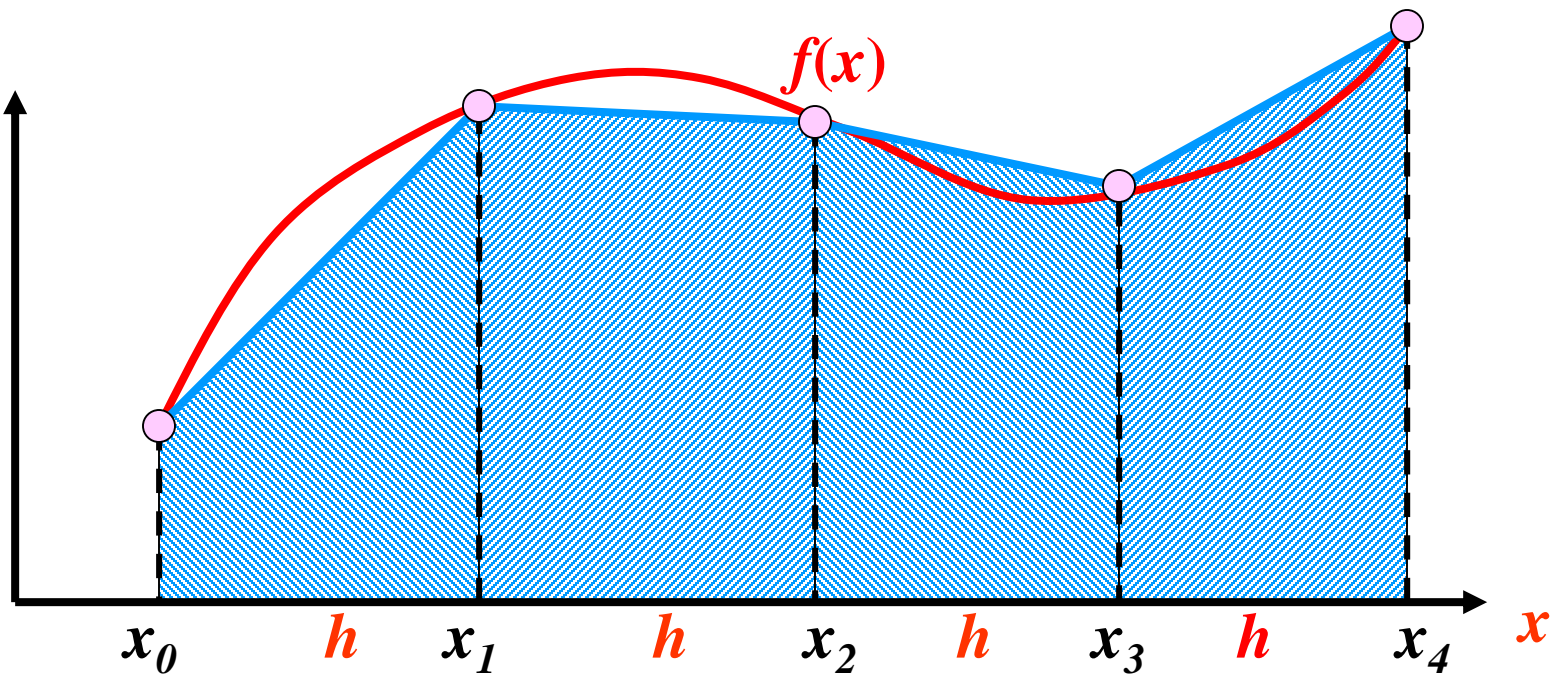
- Aproksimasi garis lurus (linier)

$$\int_a^b f(x)dx \approx \sum_{i=0}^1 c_i f(x_i) = c_0 f(x_0) + c_1 f(x_1)$$
$$= \frac{h}{2} [f(x_0) + f(x_1)]$$



# Aturan Komposisi Trapesium

$$\int_a^b f(x)dx = \int_{x_0}^{x_1} f(x)dx + \int_{x_1}^{x_2} f(x)dx + \dots + \int_{x_{n-1}}^{x_n} f(x)dx$$
$$= \frac{h}{2} [f(x_0) + f(x_1)] + \frac{h}{2} [f(x_1) + f(x_2)] + \dots + \frac{h}{2} [f(x_{n-1}) + f(x_n)]$$
$$= \frac{h}{2} [f(x_0) + 2f(x_1) + \dots + 2f(x_i) + \dots + 2f(x_{n-1}) + f(x_n)]$$



$$h = \frac{b - a}{n}$$

# Metode Integrasi Trapezoida

$$L_i = \frac{1}{2}(f(x_i) + f(x_{i+1})).\Delta x_i$$

atau

$$L_i = \frac{1}{2}(f_i + f_{i+1}).\Delta x_i$$

$$L = \sum_{i=0}^{\eta-1} L_i$$

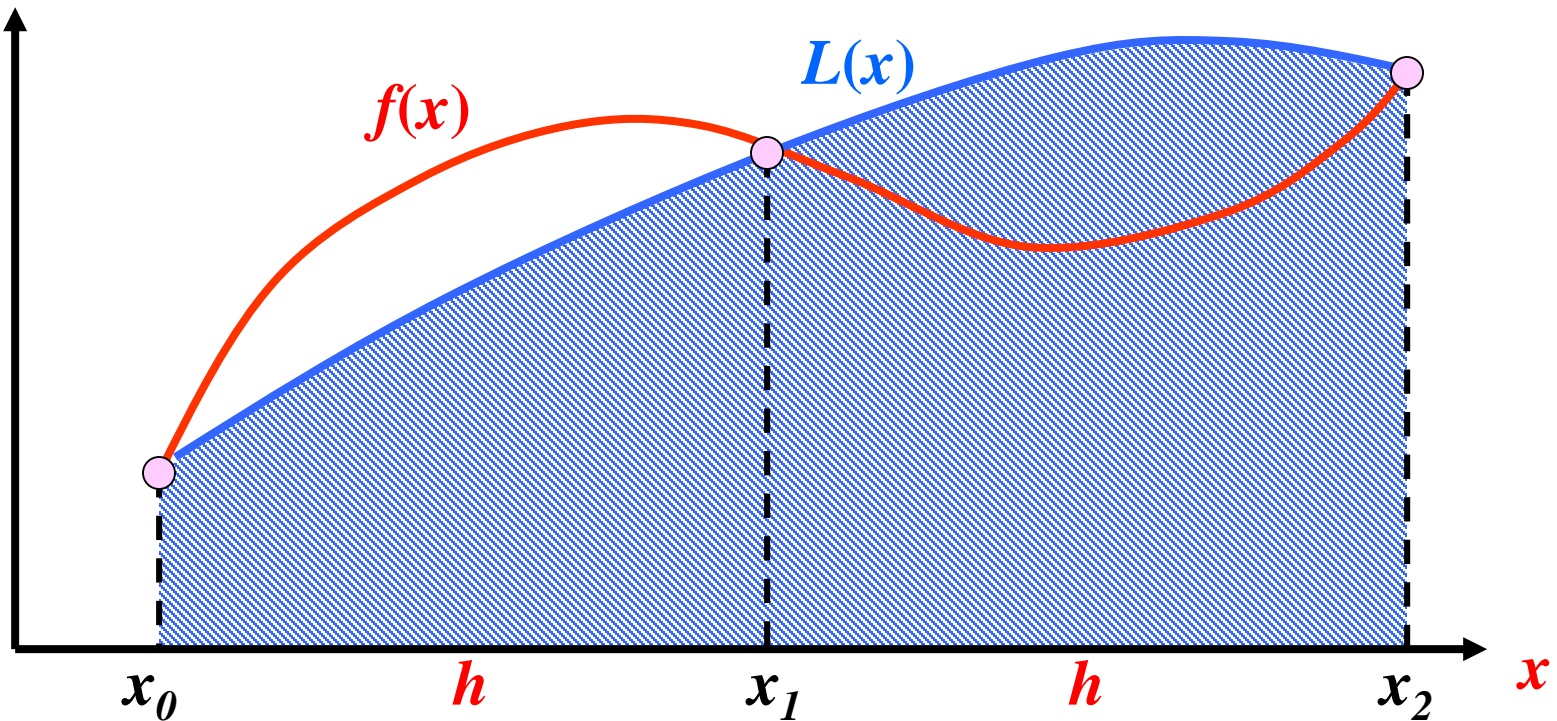
$$L = \sum_{i=0}^{n-1} \frac{1}{2} h(f_i + f_{i+1}) = \frac{h}{2}(f_0 + 2f_1 + 2f_2 + \dots + 2f_{n-1} + f_n)$$

$$L = \frac{h}{2} \left( f_0 + 2 \sum_{i=1}^{n-1} f_i + f_n \right)$$

# Aturan Simpson 1/3

## Aproksimasi dengan fungsi parabola

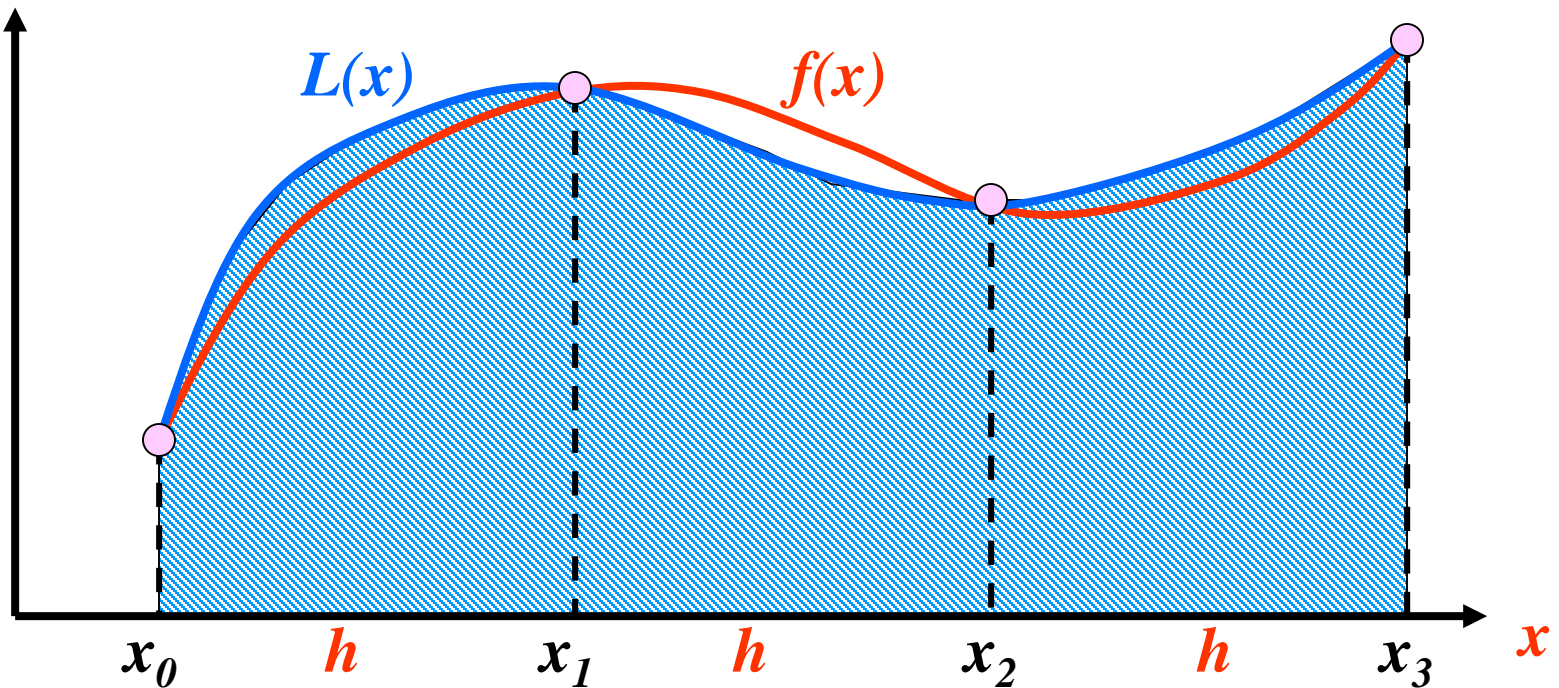
$$\int_a^b f(x) dx \approx \sum_{i=0}^2 c_i f(x_i) = c_0 f(x_0) + c_1 f(x_1) + c_2 f(x_2)$$
$$= \frac{h}{3} [f(x_0) + 4f(x_1) + f(x_2)]$$



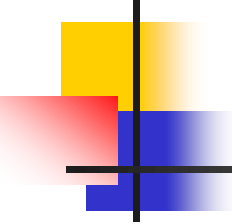
# Aturan Simpson 3/8

## Aproksimasi dengan fungsi kubik

$$\int_a^b f(x) dx \approx \sum_{i=0}^3 c_i f(x_i) = c_0 f(x_0) + c_1 f(x_1) + c_2 f(x_2) + c_3 f(x_3)$$
$$= \frac{3h}{8} [f(x_0) + 3f(x_1) + 3f(x_2) + f(x_3)]$$



# Aturan Simpson 3/8


$$L(x) = \frac{(x - x_1)(x - x_2)(x - x_3)}{(x_0 - x_1)(x_0 - x_2)(x_0 - x_3)} f(x_0) + \frac{(x - x_0)(x - x_2)(x - x_3)}{(x_1 - x_0)(x_1 - x_2)(x_1 - x_3)} f(x_1) \\ + \frac{(x - x_0)(x - x_1)(x - x_3)}{(x_2 - x_0)(x_2 - x_1)(x_2 - x_3)} f(x_2) + \frac{(x - x_0)(x - x_1)(x - x_2)}{(x_3 - x_0)(x_3 - x_1)(x_3 - x_2)} f(x_3)$$

$$\int_a^b f(x)dx \approx \int_a^b L(x)dx ; \quad h = \frac{b - a}{3} \\ = \frac{3h}{8} [f(x_0) + 3f(x_1) + 3f(x_2) + f(x_3)]$$

➤ **Error Pemenggalan**

$$E_t = -\frac{3}{80} h^5 f^{(4)}(\xi) = -\frac{(b - a)^5}{6480} f^{(4)}(\xi) ; \quad h = \frac{b - a}{3}$$