1 Integrales

- Trapecio n segmentos del mismo ancho:

$$I = \frac{h}{2}[f(x_0) + 2\sum_{i=1}^{n-1} f(x_i) + f(x_n)]$$

- Simpson 1/3, n par, $h = \frac{b-a}{n}$:

$$I \cong (b-a)\frac{f(x_0) + 4\sum_{i\in \text{impares}}^{n-1} f(x_i) + 2\sum_{j\in \text{pares}}^{n-2} f(x_j) + f(x_n)}{3n}$$

- Simpson 3/8, n impar, multiplicar por 2 los subindices divisibles entre 3

$$I = \frac{3h}{8}[f(x_0) + 3f(x_1) + 3f(x_2) + 2f(x_3) + ... + 3f(x_{n-1}) + f(x_n)]$$

- Segmentos desiguales, h_i = ancho del segmento.

$$I = h_1\frac{f(x_0) + f(x_1)}{2} + h_2\frac{f(x_1) + f(x_2)}{2} + ... + h_n\frac{f(x_{n-1}) + f(x_n)}{2}$$

2 Interpolación

- Lineal

$$f_1(x) = f(x_0) + \frac{f(x_1) - f(x_0)}{x_1 - x_0}(x - x_0)$$

- Cuadrática

$$f_2(x) = b_0 + b_1(x - x_0) + b_2(x - x_0)(x - x_1)$$

donde

$$\begin{aligned} b_0 &= f(x_0) \\ b_1 &= \frac{f(x_1) - f(x_0)}{x_1 - x_0} \\ b_2 &= \frac{\frac{f(x_2)-f(x_1)}{x_2-x_1} - \frac{f(x_1)-f(x_0)}{x_1-x_0}}{x_2 - x_0} \end{aligned}$$

- Newton

$$\begin{aligned} h &= x_{i+1} - x_i \\ k &= \frac{x - x_0}{h} \end{aligned}$$

$$f_n(x) = f(x_0) + k\frac{\Delta f}{1!} + k(k-1)\frac{\Delta^2 f}{2!} + \ldots + k(k-1)(k-2)\ldots(k-n+1)\frac{\Delta^n f}{n!}$$

- Lagrange

$$\begin{aligned} f_n(x) &= b_0(x - x_1)(x - x_2)\ldots(x - x_n) \\ f_n(x) &= \sum_{i=0}^{n} L_i(x)f(x_i) \\ L_i(x) &= \prod_{j=0, i\neq j}^{n} \frac{x - x_j}{x_i - x_j} \end{aligned}$$

3 Regresión

- Lineal

$$y = a_0 + a_1 x$$

$$\begin{aligned} a_1 &= \frac{n\sum x_i y_i - \sum x_i \sum y_i}{n\sum x_i^2 - (\sum x_i)^2} \\ a_0 &= \bar{y} - a_1\bar{x} \end{aligned}$$

- Cuadrático

$$y = a_0 + a_1 x + a_2 x^2$$

Ecuaciones normales

$$\begin{aligned} (n)a_0 + (\sum x_i)a_1 + (\sum x_i^2)a_2 &= \sum y_i, \\ (\sum x_i)a_0 + (\sum x_i^2)a_1 + (\sum x_i^3)a_2 &= \sum x_i y_i, \\ (\sum x_i^2)a_0 + (\sum x_i^3)a_1 + (\sum x_i^4)a_2 &= \sum x_i^2 y_i. \end{aligned}$$

- Regresión lineal múltiple, m dimensiones tenemos:

$$y = a_0 + a_1 x_1 + a_2 x_2$$

Ecuaciones

$$\begin{aligned} a_0 n + a_1\sum x_1 + a_2\sum x_2 &= \sum y_i \\ a_0\sum x_1 + a_1\sum x_1^2 + a_2\sum x_2\cdot x_1 &= \sum x_1 y_i \\ a_0\sum x_2 + a_1\sum x_1\cdot x_2 + a_2\sum x_2^2 &= \sum x_2 y_i \end{aligned}$$