Ejemplo: $f(x) = \ln x$

Estimar $\ln 2$ mediante polinomio de interpolación de Lagrange de primer y segundo grado, considerando $x_0 = 1$, $x_1 = 4$, $x_2 = 6$

Solución.

$x_0 = 1 \qquad f(x_0) = \ln 1 = 0$

$x_1 = 4 \qquad f(x_1) = 1.386294$

$x_2 = 6 \qquad f(x_2) = 1.791754$

Polinomio de grado 1.

$$P_1(x) = \frac{x - x_1}{x_0 - x_1} f(x_0) + \frac{x - x_0}{x_1 - x_0} f(x_1)$$

$$P_1(2) = \frac{2-4}{1-2}(0) + \frac{2-1}{4-1}(1.386294) = \frac{(1.386294)}{3} = 0.462098$$

Polinomio de grado 2.

$$P_2(x) = \frac{(x - x_1)(x - x_2)}{(x_0 - x_1)(x_0 - x_2)} f(x_0) + \frac{(x - x_0)(x - x_2)}{(x_1 - x_0)(x_1 - x_2)} f(x_1) + \frac{(x - x_0)(x - x_1)}{(x_2 - x_0)(x_2 - x_1)} f(x_2)$$

$$= \frac{(2-4)(2-6)}{(1-4)(1-6)} \ln 1 + \frac{(2-1)(2-6)}{(4-1)(4-6)} \ln 4 + \frac{(2-1)(2-4)}{(6-1)(6-4)} \ln 6$$

$$= \frac{8}{15} 0 + \frac{-4}{-6} \ln 4 + \frac{-2}{10} \ln 6 = \frac{2 \ln 4}{3} - \frac{\ln 6}{5} = 0.5658.$$

$$\ln 2 = 0.6931 \approx 0.5658$$