Determinar $f'(x)$, $f''(x)$, $f'''(x)$, $f^{IV}(x)$ de función $f(x) = 2^x$ con $h = 0.1$, centradas. $x = 3$

$$f'(x_0) = \frac{f(x_0+h) - f(x_0-h)}{2h}$$

$$f'(3) = \frac{f(3+0.1) - f(3-0.1)}{2(0.1)}$$

$$= \frac{f(3.1) - f(2.9)}{0.2} = \frac{2^{3.1} - 2^{2.9}}{0.2}$$

$$= 5.54961884$$

Valor Verdadero

$f(x) = 2^x \longrightarrow f'(x) = \ln(2)\, 2^x$

$f'(3) = \ln(2)(2^3) = 8\ln 2$

$$E_r = \left| \frac{8\ln 2 - 5.5496\,1884}{8\ln 2} \right|$$

$= 8.0094\,74115 \times 10^{-4}$

$E_{\%} = E_r(100)$

$= 8.009474115 \times 10^{-2}$ R//

$$f''(x_0) = \frac{f(x_0+h) - 2f(x_0) + f(x_0-h)}{h^2}$$

$$f''(3) = \frac{f(3+0.1) - 2f(3) + f(3-0.1)}{(0.1)^2}$$

$$= \frac{2^{3.1} - 2(2)^3 + 2^{2.9}}{0.01}$$

$$= 3.8451 6 3258$$

$$f'(x) = \ln 2 (2^x) \rightarrow f''(x) = (\ln 2)^2 \, 2^x$$

$$E_r = \left| \frac{(\ln 2)^2 (2)^3 - 3.845163258}{(\ln 2)^2 (2)^3} \right|$$

$$= 4.00441513 \times 10^{-4}$$

$$E\% = E_r (100)$$

$$= 4.00441513 \times 10^{-2} \%$$

$$f'''(x) = \frac{f(x_0+2h) - 2f(x_0+h) + 2f(x_0-h) - f(x_0-2h)}{2h^3}$$

$$f'''(3) = \frac{f(3+0.2) - 2f(3+0.1) + 2f(3-0.1) - f(3-0.2)}{2(0.1)^3}$$

$$= \frac{2^{3.2} - 2(2^{3.1}) + 2(2^{2.9}) - 2^{2.8}}{1 \times 10^{-3}}$$

$$= 2.667394\,8808$$

$$f''(x) = (\ln 2)^2 2^x \longrightarrow f'''(x) = (\ln 2)^3 2^x$$

$$E_r = \left| \frac{(\ln 2)^3 2^3 - 2.6673988808}{(\ln 2)^3 2^3} \right|$$

$$= 1.2017 09 772 \times 10^{-3}$$

$$E\% = E_r \times 100$$

$$= 1.201709772 \times 10^{-1} \%$$