

Click here to check for updates of this document <http://sitmo.com/eq/455.pdf>

First derivative: 5 point rules

created by Thijs van den Berg

$$\frac{\partial f(x_0)}{\partial x} = \frac{-3f(x_4) + 16f(x_3) - 36f(x_2) + 48f(x_1) - 25f(x_0)}{12h} + O(h^4)$$

$$\frac{\partial f(x_0)}{\partial x} = \frac{f(x_3) - 6f(x_2) + 18f(x_1) - 10f(x_0) - 3f(x_{-1})}{12h} + O(h^4)$$

$$\frac{\partial f(x_0)}{\partial x} = \frac{-f(x_2) + 8f(x_1) - 8f(x_{-1}) + f(x_{-2})}{12h} + O(h^4)$$

$$h = x_{i+1} - x_i$$

Approximation formula for the first derivative. These 5 point equations have fourth order accuracy.

Symbol list:

- x_0 The location of the first derivative of $f(x)$
- x_i Gridpoints, equally spaced
- h Distance between gridpoint