

Extra homework 6

1. Using Taylor series, prove that the forward difference $(f(x+h) - f(x))/h$ approximates the derivative $f'(x)$ with an error of order h (first order approximation), i.e.

$$f'(x) = \frac{f(x+h) - f(x)}{h} + O(h),$$

and that the centered difference $(f(x+h) - f(x-h))/2h$ approximates the derivative $f'(x)$ with an error of order h^2 (second order approximation), i.e.

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

[Python] Choose a function f , a point x and compute $f'(x)$. By taking a range of small values h , show that the errors when approximating $f'(x)$ with the finite differences above are proportional to h and h^2 , respectively.

These questions are extra. You will get bonus points for solving them.