

Lab Assignment 2 MM5016

April 8, 2021

Task 1

The functions `find_root_newton` and `find_root_secant` in the python file. They give the right root if the initial value(s) is (are) inside the interval.

Task 2

Finding the roots and testing several initial values

Run "python lab2.py" in a terminal to solve the equations with a certain method.

Dependence of initial value

From the lecture notes we now that the error of the iteration x_{n+1} to the root α can be expressed as:

$$\alpha - x_{n+1} = (\alpha - x_n)^2 \left[\frac{-f''(x_n)}{2f'(x_n)} \right].$$

So given that $\frac{-f''(x_n)}{2f'(x_n)}$ stays roughly the same, the method gets really effective when $\alpha - x_0 < 1$, as the square will be smaller.

Because the Secant method doesn't use tangents there isn't a similar error formula that can be derived from a Taylor expansion. But because secants approximate an interval better if it's smaller (given that the function is a normal continuous function), then such a choice of initial values will converge faster.