

Question 1

Use Newton's Method to approximate a root of the function

$$f(x) = x^3 - x - 1$$

starting with $x_0 = 1.5$, and compute the first two iterations: x_1 and x_2 .

Question 1 - Solution

Newton's iteration is

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}, \quad f(x) = x^3 - x - 1, \quad f'(x) = 3x^2 - 1.$$

Keeping full precision internally gives

$$x_1 = 1.5000000000 - \frac{0.8750000000}{5.7500000000} \approx \boxed{1.3478}$$

$$x_2 = 1.3478260870 - \frac{0.1006821731}{4.4499054820} \approx \boxed{1.3252}$$