MATH50003
Numerical Analysis

I.4 Newton's Method

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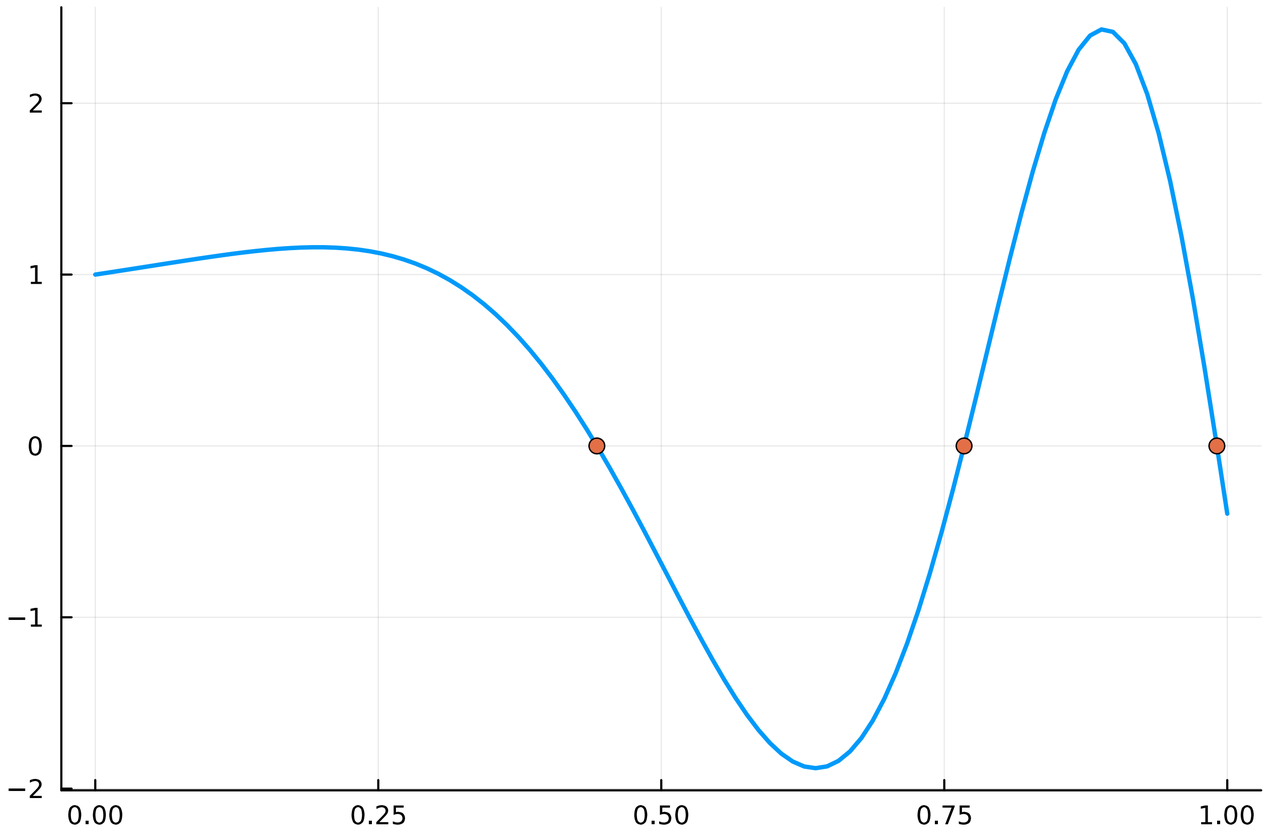
Part I

Calculus on a Computer

1. Rectangular rules for integration
2. Divided differences for differentiation
3. Dual numbers for differentiation
4. Newton’s method for root finding

Given a function, how can we find a *single* root/zero?



Newton's method

Find roots of affine functions

Given initial guess x_0:

$$f(x) \approx f(x_0) + (x - x_0)f'(x)$$

Root of right-hand side:

$$f(x_0) + (x - x_0)f'(x_0) = 0 \quad \Leftrightarrow \quad x = x_0 - \frac{f(x_0)}{f'(x_0)}$$

Let’s see how it works in practice