

Homework 5: Root Finding

CS 205A: Mathematical Methods for Robotics, Vision, and Graphics (Winter 2018)
Stanford University

Due Thursday, Feb 22, before 11:59 PM (via gradescope)

Textbook problems: :

1. 8.1 (10 points) Computation cost of Newton's method
2. 8.3 (10 points) Choosing Root-finding methods
3. 8.5 (5 points) Newton's method quadratic convergence?
4. 8.8 (20 points) Newton-Raphson Division
5. 8.10a (5 points) Relationship between roots of a function and its derivative

Julia Programming Assignment (50 points): Implement "Dekker's method" as described in section 8.1.6 to find the roots of the following polynomial:

$$p(x) = x^5 - \frac{29x^4}{20} + \frac{29x^3}{36} - \frac{31x^2}{144} + \frac{x}{36} - \frac{1}{720}$$

on the interval $x \in [0, 1]$. You must implement Dekker's method by hand.

Since Dekker's method only produces a single root in an interval, starter code has been provided that will call your Dekker function to find all the roots of the polynomial.

1. How many unique roots are there?
2. What are the root x -values of the polynomial to at least 10 digits of accuracy?
3. How many steps until your method converged when called for a single root inside $[0.1, 0.8]$?
What root did your algorithm converge towards?

To simplify submission to GradeScope with your other written homework, export a PDF of a clearly documented Julia Notebook that shows your work.