

Problem Sheet 5

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Q. 1 For a continuous function $f : \mathbf{R} \rightarrow \mathbf{R}$ a point x_0 such that $f(x_0) = 0$ is called a root of the function. If for an interval $[a, b]$, $f(a) \cdot f(b) < 0$ then there exists a point $x_0 \in (a, b)$ which is a root of the function. Numerically, there are various methods to find approximate roots of a function in an interval. The bisection method, the secant method and the Newton Raphson method to name but a few. Implement a class called `Root_finder` which has all the above mentioned methods incorporated to find a root of any function.

Q. 2 Define a `vector` class that contains a pointer for the entries, an integer for the size of the vector and one, two and maximum norm functions. Overload the following operators appropriately:

- (a) the "+" operator;
- (b) the "-" operator;
- (c) the "*" operator with vector multiplication;
- (d) overload the operator "[]" to access array elements;
- (e) how would you achieve scalar multiplication?

Test your definitions on a few simple vectors.

Q. 3 Write a C++ program that returns the elements in a vector that are strictly smaller than their adjacent left and right neighbours.

Example:

Original Vector elements:

1 2 5 0 3 1 7

Vector elements that are smaller than its adjacent neighbours:

0

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