Problem Sheet 5

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Q. 1 For a continuous function $f : \mathbf{R} \to \mathbf{R}$ a point x_0 such that $f(x_0) = 0$ is called a root of the function. If for an interval $[a, b]$, $f(a).f(b) < 0$ 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 Design and create a class called "`complex`" which stands for complex numbers. Overload all the basic operators relevant to this particular class.

Q. 4 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
1