CS110: Computer Programming Lab
Department of CSE
IIT, Guwahati

Module 02 Stage 03 Exercise 10

Problem description

We need to find a root of the expression given below that lies between 3 and 4 by repeatedly guessing an interval for the answer.

$X^4 - 17.02\ X^3 + 98.8601\ X^2 - 220.7408\ X + 137.9007$

(This information is only for the curious and is not relevant to write the program. The roots of the equation are: 1, 3.71, 5.31, and 7).

Write a program that uses two values representing the endpoints of a range containing exactly one root value (and neither end-point is the root of the equation), defines a narrower range.

The idea is to use the program repeatedly to get a very close approximation of the root. This can be done by repeating the computations of the narrower range. The search for the range can be terminated when we have achieved the desired level of precision.

For example, if the answer should be correct to 4 places after decimal, you must continue to run the loop till the rounded value of the 4^{th} digit after the decimal point is same for the upper and lower end of the range in which the root lies.

One way to find the narrower range is to find the mid-point of the given range that contains the root. Determine if the the root is on the mid-point. If so the program can terminate with answer. Otherwise, determine which side of the mid-point the root lies. Repeat the program with the newly found range.