ZCE 111
Assignment 8

Q1

Write a code to implement bisection method so that, given any continuous function $f(x)$, it can

(i) Count the number of roots in a domain [a,b].

(ii) Evaluate each of these roots one by one in sequence.

Try your code on the following functions

(i) $f(x) = e^x - x - 2$, for all x.

(ii) $f(x) = x^3 + 2x^2 - 3x - 1$, for all x

(iii) $f(x) = (1/x) \sin x$, for $-3\pi \leq x \leq 3\pi$.

(iv) $f(x) = \tan(\pi x) - x - 6$, for $-3\pi \leq x \leq 3\pi$.

Use $\varepsilon = 0.001$. You code is suppose to be able to find out the roots in all the functions automatically and without manual intervention.

Q2

Repeat Q1 for Newton-Ralpson method.

Q3

Given the functions *f* and *g*, find all the points (x,y) at which both curves intersect. Method: Mathematica built-in functions FindRoot or Nsolve. You should display these function before finding their roots.

- $f(x) = (1/x)\sin(x)$, $g(x) = (1/x)\sin(x - 1.45\,\pi)$, for all $-3\pi \le x \le 3\pi$.

Q4

Consider the function $f(x)= x \sin(4x)$ for the interval $-4\pi \leq x \leq 4\pi$, and a horizontal line $y(x)=h$.

- Plot the functions on the same graph for any given value of real h.
- Write a Mathematica code that automatically counts the number of points, N, the $y(x)=h$ line intersect with $f(x)$ for any given real value of h.
- Hence, plot the number of intersection N as a function of h for all real value of h.