

Bisection Method

Result:

In both of the questions function has same sign (positive) on the interval values. For the bisection method we need the signs of function values to be different at the boundary points.

Thus in this interval bisection method cannot be applied.

Discussion:

1. The first function is always greater than equal to zero, so the initial condition is not satisfied which is the reason why the bisection method cannot be used to find the root for this kind of equation
2. For the second function, the function values at the interval are both greater than zero, hence the bisection values cannot be used for this interval. To find the roots of this equation using the bisection method we should take a value in the positive and another in the negative range.

Newton's Method

Result: for this method tolerance of .0001 has been used and the run the code for different guess values.

1. $(x) = x^2 - 2000x + 1000000$

Initial guess	Root	Number of iterations
0	1000	24
100	1000	24
1000	nan	1
10000	1000	27

2. $x^2 - 200x + 9999.9999$

Initial guess	Root	Number of iterations
0	99.99	16
100	99.99	16
1000	100.01	19

Discussion:

1. For first problem as there is only one root for both higher and lower values the answer converges to the value of 1000. Also for values from 0 to 100 it takes 24 iteration, whereas as we increase for values greater than 1000 numbers of iterations keep increasing.

2. In second problem there are two roots so for initial guesses less than 100 it goes to 99.99 whereas for values greater than 100 it goes to 100.01 with increase in iterations.

Secant Method

Results:

For the Secant method using tolerance = 0.0001, the roots are obtained. The number of iterations to achieve the solution is shown in the given table.

1. $f(x) = x^2 - 2000x + 1000000$

Initial guess	Second Initial guess	Root	Number of iterations
0	10000	999.9999	35
100	10000	1000	35
1000	10000	1000	35
10000	10000	1000	35

$$f(x) = x^2 - 200x + 9999.9999$$

Initial guess	Second Initial guess	Root	Number of iterations
0	1000	999.989	24
100	1000	999.9998	2
1000	1000	100.01	29

1. For the first function, we see that the root is 999.99 and 1000 for same number of iterations. The number of iterations are the same when the initial guesses are far from the solution and even if it's close to the solution.

2. $f(x) = x^2 - 200x + 9999.9999$

For the second function, when the first initial guess is 0, we get the root as 99.989, whereas when the first guess is higher than the bigger root (100.01) than the root we get is 100.01.