

Numerical Computing Lab Session 1:

Task 1(If more than one root kindly mention all values)

Function	Root (by visualization)
$f_1(x) = \cos \cos (x) - 1.3x$	$x = 0.62$
$f_2(x) = x \cos \cos (x) - 2x^2 + 3$	$x = 0.28, 1.28$
$f_3(x) = 2x \cos \cos (2x) - (x +$	$x = -2.25, -0.75$

Task 2 (Bisection Method)

$$f_1(x) = \cos \cos (x) - 1.3x$$

Tol	No. of Iterations	Interval	Root
0.001	15	[10, -10]	$x = 0.624389648$
0.00001	21	[10, -10]	$x = 0.624189377$

Repeat the process by selecting another interval

Tol	No. of Iterations	Interval	Root
0.001	10	[0, 1]	$x = 0.624023438$
0.00001	17	[0, 1]	$x = 0.624183655$

$$f_2(x) = x \cos \cos (x) - 2x^2 + 3x - 1$$

Tol	No. of Iterations	Interval	Root
0.001	10	[0, 1]	$x = 0.297851562$
0.00001	17	[0, 1]	$x = 0.297523499$

Repeat the process by selecting another interval

Tol	No. of Iterations	Interval	Root
-----	-------------------	----------	------

0.001	10	[0, 0.6]	x=0.297070312
0.00001	16	[0, 0.6]	x=0.297537231

$$f_3(x) = 2x \cos \cos(2x) - (x + 1)^2$$

Tol	No. of Iterations	Interval	Root
0.001	12	[-5, -1]	x=-2.190429688
0.00001	19	[-5, -1]	x=-2.191307068

Repeat the process by selecting another interval

Tol	No. of Iterations	Interval	Root
0.001	8	[-2, -2.2]	x=-2.191406250
0.00001	15	[-2, -2.2]	x=-2.191302490

Write your Observations:

1. Increasing the tolerance level increases the number of iterations.
2. Decreasing the interval span decreases the number of iterations.

Task 3 (Newton Raphson Method)

$$f_1(x) = \cos \cos(x) - 1.3x$$

Tol	No. of Iterations	Starting Point	Root
0.001	3	1	x=0.624184580
0.00001	4	1	x=0.624184578

Repeat the process by selecting another interval

Tol	No. of Iterations	Starting Point	Root
-----	-------------------	----------------	------

0.001	6	-1	x=0.624184605
0.00001	7	-1	x=0.624184578

$$f_2(x) = x \cos \cos(x) - 2x^2 + 3x - 1$$

Tol	No. of Iterations	Starting Point	Root
0.001	5	-1	x=0.297530234
0.00001	5	-1	x=0.297530234

Repeat the process by selecting another interval

Tol	No. of Iterations	Starting Point	Root
0.001	3	0.2	x=0.297530232
0.00001	4	0.2	x=0.297530234

$$f_3(x) = 2x \cos \cos(2x) - (x + 1)^2$$

Tol	No. of Iterations	Starting Point	Root
0.001	5	-3	x=-2.191308012
0.00001	6	-3	x=-2.191308012

Repeat the process by selecting another interval

Tol	No. of Iterations	Starting Point	Root
0.001	4	-2	x=-2.191308012
0.00001	4	-2	x=-2.191308012

Write your Observations:

1. Increasing the tolerance level increases the number of iterations.
2. If the start point is nearer to the root, then there will be less no. of iterations comparatively.

Task 4:

Function	Root (by fsolve)
$f_1(x) = \cos \cos(x) - 1.3x$	0.62418458
$f_2(x) = x \cos \cos(x) - 2x^2 + 3$	0.29753023
$f_3(x) = 2x \cos \cos(2x) - (x +$	-2.19130801