Numerical Computing Lab Session 1:

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

|  |  |
| --- | --- |
| Function | Root (by visualization) |
|  | x = 0.62 |
|  | x= 0.28, 1.28 |
|  | x=-2.25, -0.75 |

**Task 2 (Bisection Method)**

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |

|  |  |  |  |
| --- | --- | --- | --- |
| 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)**

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |

|  |  |  |  |
| --- | --- | --- | --- |
| 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 comparitively.

**Task 4:**

|  |  |
| --- | --- |
| Function | Root (by fsolve) |
|  | 0.62418458 |
|  | 0.29753023 |
|  | -2.19130801 |