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Numerical Computing Lab Session 1:

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

|  |  |
| --- | --- |
| Function | Root (by visualization) |
|  | 0.624 |
|  | 0.298 , 1.257 |
|  | -2.191, -0.798 |

**Task 2 (Bisection Method)**

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

Repeat the process by selecting another interval

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 14 | [-5, 5] | 0.624389648 |
| 0.00001 | 20 | [-5, 5] | 0.624189377 |

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 10 | [-0.5, 0.5] | 0.297851562 |
| 0.00001 | 17 | [-0.5,0.5] | 0.297523499 |

Repeat the process by selecting another interval

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 11 | [-1,1] | 0.297851562 |
| 0.00001 | 18 | [-1,1] | 0.297523499 |

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 11 | [-1,1] | -0.797851562 |
| 0.00001 | 18 | [-1,1] | -0.798164368 |

Repeat the process by selecting another interval

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 12 | [-2,2] | -0.797851562 |
| 0.00001 | 19 | [-2,2] | -0.798164368 |

Write your Observations:

There is a slight difference between the roots at the same interval whereas number of iterations increase with number of tolerance decreases

**Task 3 (Newton Raphson Method)**

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 6 | -1 | 0.624184605 |
| 0.00001 | 7 | -1 | 0.624184578 |

Repeat the process by selecting another interval

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 10 | -1.5 | 0.624184578 |
| 0.00001 | 10 | -1.5 | 0.624184578 |

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 4 | 0.5 | 0.297530234 |
| 0.00001 | 5 | 0.5 | 0.297530234 |

Repeat the process by selecting another interval

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 4 | -0.5 | 0.297530062 |
| 0.00001 | 5 | -0.5 | 0.297530234 |

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 3 | -1.25 | -0.798160100 |
| 0.00001 | 4 | -1.25 | -0.798159961 |

Repeat the process by selecting another interval

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 3 | -2.25 | -2.191308012 |
| 0.00001 | 3 | -2.25 | -2.191308012 |

Write your Observations:

The Newton Raphson Method perform much better than bisection in terms of finding root in less no of iterations with minimal difference between Root at different value of tolerance.

**Task 4:**

|  |  |
| --- | --- |
| Function | Root (by fsolve) |
|  | 0.62418458 at -1 |
|  | 0.29753023 at 0 |
|  | -0.79815996 at 1 |