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Numerical Computing Lab Session 1:

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

|  |  |
| --- | --- |
| Function | Root (by visualization) |
|  | 0.80 |
|  | 1.25 |
|  | 2.6, 0.10 |

**Task 2 (Bisection Method)**

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 10 | 0,1 | 0.624023 |
| 0.00001 | 18 | 0,1 | 0.624184 |

Repeat the process by selecting another interval.

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 13 | -3,4 | 0.623901 |
| 0.00001 | 20 | -3,4 | 0.624188 |

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 10 | 0,1 | 0.297852 |
| 0.00001 | 17 | 0,1 | 0.297523 |

Repeat the process by selecting another interval.

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 11 | 1,3 | 1.25684 |
| 0.00001 | 18 | 1,3 | 1.25663 |

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 12 | -1,2 | -0.798584 |
| 0.00001 | 19 | -1,2 | -0.798155 |

Repeat the process by selecting another interval.

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 12 | -2,1 | -0.798096 |
| 0.00001 | 19 | -2,1 | -0.7981591 |

Write your Observations:

The no of iterations increased upon changing the intervals and in part a the root was same uptill 2 Decimal places.

For part b and part c the root was same uptill 3 decimal places.

**Task 3 (Newton Raphson Method)**

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 4 | 0 | 0.624185 |
| 0.00001 | 4 | 0 | 0.624185 |

Repeat the process by selecting another interval.

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 3 | 1 | 0.624185 |
| 0.00001 | 4 | 1 | 0.624185 |

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 4 | 0 | 0.29753 |
| 0.00001 | 4 | 0 | 0.29753 |

Repeat the process by selecting another interval.

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 4 | 1 | 1.25662 |
| 0.00001 | 5 | 1 | 1.25662 |

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 6 | 2 | -2.19131 |
| 0.00001 | 6 | 2 | -2.19131 |

Repeat the process by selecting another interval.

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 4 | 3 | -0.79816 |
| 0.00001 | 4 | 3 | -0.79816 |

Write your Observations:

Newton Raphson is way much better method by bisection as we reached the root in less no of iterations. The roots are also exactly the same when we changed the intervals.

**Task 4:**

|  |  |
| --- | --- |
| Function | Root (by fsolve) |
|  | 0.62418458 |
|  | 0.29753023 |
|  | -0.79815996 |