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Numerical Computing Lab Session 1:

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

|  |  |
| --- | --- |
| Function | Root (by visualization) |
| 1) *f*(*x*)=*cos*(*x*)−1.3*x* | 0.7 |
| 2) *f*(*x*)=*xcos*(*x*)−2*x*2+3*x*−1 | 0.4, 1.7 |
| 3) *f*(*x*)=2*xcos*(2*x*)−(*x*+1)2 | -2.4, -0.8 |

**Task 2 (Bisection Method)**

**1) *f*(*x*)=*cos*(*x*)−1.3*x***

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 8 | 0.617188, 0.625 | 0.623047 |
| 0.00001 | 15 | 0.624146, 1 | 0.624207 |

Repeat the process by selecting another interval

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 1 | -2,2 | 0 |
| 0.00001 | 17 | 0.624146, 0.624207 | 0.624207 |

**2) f(x)=xcos(x)−2x2+3x−1**

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 1 | 0,1 | 0.5 |
| 0.00001 | 15 | 0.297485,  0.297546 | 0.297546 |

Repeat the process by selecting another interval

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 1 | 0,0.5 | 0.25 |
| 0.00001 | 14 | 0.297485, 0.297546 | 0.297546 |

**3) *f*(*x*)=2*xcos*(2*x*)−(*x*+1)2**

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 1 | -1,1 | 0 |
| 0.00001 | 16 | -0.798218, -0.798157 | -0.798157 |

Repeat the process by selecting another interval

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Interval | Root |
| 0.001 | 1 | -1,2 | 0.5 |
| 0.00001 | 16 | -0.798218, -0.798126 | -0.798126 |

Write your Observations:

All initial intervals are not working on every function, Bisection

Method is taking many iteration to make the error lesser.

**Task 3 (Newton Raphson Method)**

**1) *f*(*x*)=*cos*(*x*)−1.3*x***

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 1 | 1 | 0.645245 |
| 0.00001 | 3 | 1 | 0.624185 |

Repeat the process by selecting another interval

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 1 | 2 | 0.634794 |
| 0.00001 | 3 | 2 | 0.624185 |

**2) *f*(*x*)=*xcos*(*x*)−2*x^*2+3*x*−1**

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 1 | 1 | 1.41524 |
| 0.00001 | 5 | 1 | 1.25662 |

Repeat the process by selecting another interval

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 1 | 2 | 1.47029 |
| 0.00001 | 5 | 2 | 1.25662 |

**3) *f*(*x*)=2*xcos*(2*x*)−(*x*+1)^2**

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 1 | 1 | 1.06379 |
| 0.00001 | 20 | 1 | 1.25645 |

Repeat the process by selecting another interval

|  |  |  |  |
| --- | --- | --- | --- |
| Tol | No. of Iterations | Starting Point | Root |
| 0.001 | 1 | 0.7 | 0.812623 |
| 0.00001 | 23 | 0.7 | 1.25644 |

Write your Observations:

New raphson method is very precise and take less iteration

to give minimum errored value.

**Task 4:**

|  |  |
| --- | --- |
| Function | Root (by fsolve) |
| *f*1(*x*)=*cos*(*x*)−1.3*x* | 0.58 |
| *f*2(*x*)=*xcos*(*x*)−2*x*2+3*x*−1 | 0.31, 1.25 |
| *f*3(*x*)=2*xcos*(2*x*)−(*x*+1)2 | -2.19131, -0.79816 |