

MA-221(Numerical Analysis)
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Lab Assignment-4
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Instructions

- Solve using both **Fixed-Point Iteration** and **Secant Method**.
- Use appropriate stopping criteria for numerical methods.
- Find a root with an error tolerance of 10^{-12} .
- Compare the convergence rates of the Fixed-Point Iteration and Secant Method for each equation.
- Explain why certain equations may converge faster with one method compared to the other.

Problem 1: Root Finding Using Fixed-Point Iteration and Secant Method

1. $x = \frac{2+x^2}{4}$, with initial guesses $x_0 = 0.5$, $x_1 = 1.2$.
2. $x = \arcsin(x - 0.5)$, with initial guesses $x_0 = 0.1$, $x_1 = 0.4$.
3. $\tan(x) = x^2 - 3$, with initial guesses $x_0 = 1$, $x_1 = 2$.
4. $x = \sin(x) + 0.5$, with initial guesses $x_0 = -0.4$, $x_1 = 0.6$.
5. $\sinh(x) - x^2 + 2 = 0$, with initial guesses $x_0 = -0.5$ and $x_1 = 0.8$
6. $x - \ln(x + 2) = 0$, with initial guesses $x_0 = 0.1$, $x_1 = 1$.
7. $\cos(x) - x = 0$, with initial guesses $x_0 = 0.2$, $x_1 = 0.9$.
8. $\sqrt{x+1} - x^2 = 0$, with initial guesses $x_0 = 0.1$, $x_1 = 0.9$.

Submission Guidelines

- Submit your Python or MATLAB or C++ code for all problems.