Today:

- Review of methods and codes
- Questions concerning the midterm
## At a glance:

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Bisection Method: Use bisection.m and bisection_ex.m.

- In bisection_ex.m, change \(a, b, tol, max_iter\), and \(f\)
- Current example approximates the root of \(f(x) = x - \cos x\) on the interval \([0, 1]\) with tolerance \(10^{-4}\)
- Example summary: “The bisection method approximates the root \(p \approx 0.739075\) in 14 iterations with a tolerance \(1e^{-4}\).”
Fixed-Point Iteration: Use fixedpoint.m and fixedpoint_ex.m.

- In fixedpoint_ex.m, change $p_0$, $tol$, $max_iter$, and $g$
- Current example approximates the fixed point of $g(x) = \cos x$ (i.e. the root of $f(x) = x - \cos x$) with initial guess $p_0 = 0.75$ and tolerance $10^{-4}$
- Example summary: “The fixed-point iteration approximates the root $p = 0.739129$ in 14 iterations with a tolerance $1e-4$."

Newton’s Method: Use newton.m and newton_ex.m.

- In newton_ex.m, change $p_0$, $tol$, $max_iter$, $f$, and $f'$
- Current example approximates the root of $f(x) = x - \cos x$ with initial guess $p_0 = 0.75$ and tolerance $10^{-4}$
- Example summary: “The Newton’s method approximates the root $p = 0.739111$ in 1 iteration with a tolerance $1e-4$.”
Secant Method: Use `secant.m` and `secant_ex.m`.

- In `secant_ex.m`, change $p_0$, $p_1$, $tol$, $max_iter$, and $f$
- Current example approximates the root of $f(x) = x - \cos x$ with initial guesses $p_0 = 0.75$, $p_1 = 0.5$ and tolerance $10^{-4}$
- Example summary: “The secant method approximates the root $p = 0.739124$ in 3 iterations with a tolerance $1e^{-4}$.”
Method of False Position: Use falseposition.m and falseposition_ex.m.

- In falseposition_ex.m, change $p_0$, $p_1$, $tol$, $max\_iter$, and $f$
- Current example approximates the root of $f(x) = x - \cos x$ with initial guesses $p_0 = 0.75$, $p_1 = 0.5$ and tolerance $10^{-4}$
- Example summary: “The method of false position approximates the root $p = 0.739084$ in 3 iterations with a tolerance $1e-4$.”
Modified Newton’s Method: Use modifiednewton.m and modifiednewton_ex.m.

• In modifiednewton_ex.m, change $p_0$, $tol$, $max_iter$, $f$, $f'$, and $f''$.

• Current example approximates the root of $f(x) = x - \cos x$ with initial guess $p_0 = 0.75$ and tolerance $10^{-4}$.

• Example summary: “The Modified Newton’s method approximates the root $p = 0.73908$ in 2 iteration with a tolerance $1e-4$.”
Aitken’s Method: Use `aitkens.m` and `aitkens_ex.m`.

- In `aitkens_ex.m`, change $p_0$, `tol`, `max_iter`, and $g$
- Current example approximates the fixed point of $g(x) = \cos x$ (i.e. the root of $f(x) = x - \cos x$) with initial guess $p_0 = 0.75$ and tolerance $10^{-4}$
- Example summary: “The Aitken’s method approximates the root $p = 0.739067$ in 1 iteration with a tolerance $1e-4$. ”
Steffensen’s Method: Use `steffensens.m` and `steffensens_ex.m`.

- In `steffensens_ex.m`, change $p_0$, $tol$, $max_iter$, and $g$
- Current example approximates the fixed point of $g(x) = \cos x$ (i.e. the root of $f(x) = x - \cos x$) with initial guess $p_0 = 0.75$ and tolerance $10^{-4}$
- Example summary: “The Steffensen’s method approximates the root $p = 0.739067$ in 1 iteration with a tolerance $1e-4$.”
Horners’s Method: Use `horners.m` and `horners_ex.m`.

- In `horners_ex.m`, change $x_0$, $a$, and $n$
- Current example evaluates $P(x) = 2x^4 - 3x^2 + 3x - 4$ at $x_0 = -2$
Comparing All Root Finding Methods: Use bisection.m, fixedpoint.m, newton.m, secant.m, falseposition.m, modifiednewton.m, aitkens.m, steffensens.m, and compare_ex.m

- In compare_ex.m, change a, b, p_0, p_1, tol, max_iter, f, f', f'', and g
- Current example approximates the root of f(x) = x − cos x (or fixed point of g(x) = cos x) on the interval [0, 1], with p_0 = 0.75, p_1 = 0.75, and tolerance 10^{-4}

Questions?