

Assignment #11

Due Friday, 11 December, 2015 at the start of class

Please read Lectures 21, 22, 23, 24, 25 in Trefethen & Bau.

Exercise 15.1 in Lecture 15. Do (e), (f), and (g). That is, *redo* these parts. Here are some comments which apply to all of these parts:

- Because these problems have no inputs, “backward stable” is impossible unless the algorithm gets the exact answer ... which is not true.
- Also because these problems have no inputs, the definition of “stable” reduces to only checking the condition on the forward error in the case of no inputs, i.e. checking $\|\tilde{f}() - f()\|/\|f()\| = O(\epsilon_{\text{machine}})$.
- If you claim “stable” then you should be able to prove it. By contrast, *proving* “unstable” essentially requires an informal argument, under (13.5) and (13.7), because we cannot exclude magical coincidences that make all the ϵ much smaller than $\epsilon_{\text{machine}}$. So, if you claim “unstable”, then *do* argue clearly, and with adequate support from application of (13.5) and (13.7), that the error must be bigger than a constant C times $\epsilon_{\text{machine}}$ as $\epsilon_{\text{machine}} \rightarrow 0$, where the constant is independent of $\epsilon_{\text{machine}}$. *Don't* expect your argument to be as rigorous as those for “backward stable” and “stable.”

Exercise 21.1 in Lecture 21.

Exercise 22.1 in Lecture 22.

Exercise 23.1 in Lecture 23.

Exercise 23.3 in Lecture 23.

Exercise 24.1 in Lecture 24.

Exercise 24.3 in Lecture 24.