

Homework 0

APPM/MATH 4650 Fall 2020 Numerical Analysis

Due date: Friday, August 28, before 5 PM

Instructor: Prof. Becker

Theme: Matlab/Python practice

Instructions Collaboration with your fellow students is OK and in fact recommended, although direct copying is not allowed. The internet is allowed for basic tasks (e.g., looking up definitions on wikipedia) but it is not permissible to search for proofs or to *post* requests for help on forums such as <http://math.stackexchange.com/> or to look at solution manuals. Please write down the names of the students that you worked with.

An arbitrary subset of these questions will be graded.

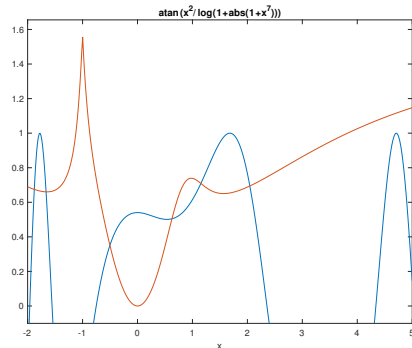
Comment This is an **optional** homework, and will not be graded. It's designed to brush up any rusty python/Matlab skills (or if you are a Matlab user, you could use this to try out Python).

Problem 1: Graph the functions (in the same figure)

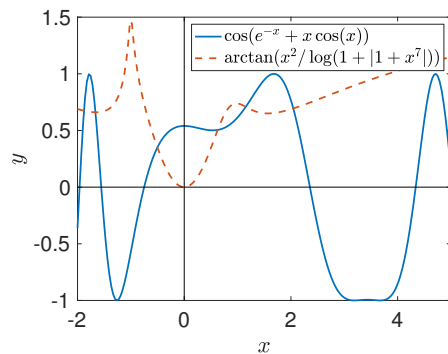
$$f(x) = \cos(e^{-x} + x \cos(x)), \quad g(x) = \arctan\left(\frac{x^2}{\log(1 + |1 + x^7|)}\right),$$

on the domain $-2 \leq x \leq 5$.

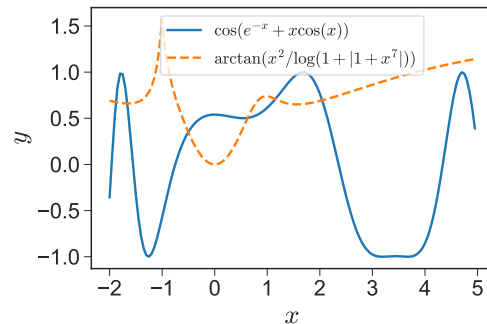
Make your plot nice, i.e., don't just make it like this



but rather make it professional, like



or



(made

in Matlab and Python, respectively).

Matlab tips To save your figure as a nice PDF (use PDF rather than PNG/JPEG, because PDF can embed fonts, rather than convert them to bitmapped graphics that look bad if you resize them), use `export_fig`.

Python tips Use `numpy` rather than `math` for the trig and exponential functions, since then it is automatically vectorized and will work with `numpy.arange` or `numpy.linspace` nicely. I suggest using `matplotlib`, especially `matplotlib.pyplot` if you're used to Matlab style plotting. Some good quickstart guides are at [/github.com/matplotlib/cheatsheets](https://github.com/matplotlib/cheatsheets). Very fancy tweaks are described at seaborn.pydata.org/tutorial/aesthetics.html.

If you're using a Jupyter notebook (common for Python, but in fact also possible for Matlab: see the internet for how-to), and want to export the entire Jupyter notebook to a PDF (a nice way to turn in homework), you can do so via "Download > PDF via LaTeX" if you've installed `pandoc`. This step is probably best done on a local instance of Jupyter (as opposed to JupyterHub on a server, or using google's colab).

Doing it this way, the figures are rasterized, which is ugly; you might have more luck fine-tuning by using `nbconvert` directly.