Pre-class assignment # 4

PHY-905-005
Computational Astrophysics and Astrostatistics
Spring 2023

This assignment is due the evening of Monday January 23, 2023. Turn in your code and all materials via the GitHub Classroom.

Reading:

1. Section 6.1 of *Computational Physics*, by M. Newman
2. Wikipedia article on Gaussian elimination
3. Numerical methods for matrices, part 1: Sections 5.1-5.3 of *An Introduction to Computational Physics*, by T. Pang (optional; PDF provided)
4. NumPy linear algebra routines (reference)
5. SciPy linear algebra routines (reference)

Your assignment:

For the matrices A and B in the included file `matrix_1.py`, write two functions that uses Gaussian elimination with partial pivoting to (1) get the upper-triangular matrix and (2) calculate the determinant of the matrix using the upper-triangular matrix. Do this without destroying the original matrix by making a copy of the matrix (with `numpy.copy`) and compare your calculated determinant to the output of the `scipy.linalg.det` routine, as run on the same matrix. Suggestion: invent your own small matrix (perhaps a 3×3 matrix) to test your routines on so that you can verify that it's behaving correctly on a step-by-step basis! **Make sure to write your code as functions that take input matrices – you're going to need those functions in class!**

Submit your *easy-to-read and commented* code to the repository (use the `class_coding_standard.md` document as a basis for this, which is included in this repository). Also, put any remaining questions that you might have in the file `ANSWERS.md`, and push all of the files as your homework submission!