

Symbolic Programming

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1 Introduction

1.1 Why SymPy ?

- See the list of computer algebra systems¹ from Wikipedia.
- I have used **Mathematica**, **Maple**, **Maxima**, and **SymPy**. All are good. **WolframAlpha** is very useful but only allows one line to edit. Wolfram Cloud ²Wolfram Cloud is a version of WolframAlpha that lets you write programs as in **Python**. It is free but it has limitations.
- It is written entirely in **Python**. **Python** is free and robust, and very popular today. We can combine it with **NumPy** and **Matplotlib**.
- Use **WolframAlpha** for quick tests or graphics. Use **SymPy** for complete documented programs.

Here is a link ³ important information about **SymPy** such as

- a list of projects which use **SymPy**,
- quick links to useful resources,
- list of releases with their dates.

¹https://en.wikipedia.org/wiki/List_of_computer_algebra_systems

²<https://www.wolframcloud.com/>

³<https://www.sympy.org/en/index.html>

1.2 How to do your reports (homeworks)?

You can use an almost unlimited set of resources.

- Use what you know
- Use what you learned in class and the class notes and videos
- Use the internet: Google, StackOverflow, ChatGPT (they are good friends)
- Ask your class mates (do not copy their work, just ask for help).
- Ask me.

2 Program

- Arithmetic
- Algebra
- Differential Calculus
- Integral Calculus
- Multidimensional Calculus
- Differential Equations.

Other important topics not covered here. However you can see pieces of these in the lectures.

- Complex variables
- Linear Algebra
- Fourier Analysis
- Transform theory: Fourier, Laplace, Hankel, Mellin, Sine, and Cosine transforms and their inverse transforms
- Distribution theory (Dirac Deltas, Heaviside functions, etc.)
- Special functions, such as Gamma, Beta, Fresnel integrals, Error function, Elliptical Integrals, Hypergeometric functions, etc.