Getting Started and Getting Help

1. Getting Started
   - SageMath and CoCalc, Jupyter notebooks

2. Getting Help
   - personal and online

3. Precision and Accuracy
   - approximating numbers

MCS 320 Lecture 3
Introduction to Symbolic Computation
Jan Verschelde, 12 June 2024

Getting Started and Getting Help

Getting Started

The essential points about this course are listed below.

1. The course web site is at
   http://homepages.math.uic.edu/~jan/mcs320
   with backup at https://janv.people.uic.edu/mcs320.

2. Install (and/or signup) the free open source system SageMath.
   - https://www.sagemath.org for source, docs, installation, etc.
   - https://cocalc.com for online execution.

3. The Jupyter notebooks that you will make in this course will be
   your most important resources.

Getting Started and Getting Help

Getting Help

1. Office hours are Monday, Wednesday, Friday, online, or, on campus in SEO 1210, from 4pm to 5pm. We can also make an appointment.

   The TA grader Ling Yu has office hours on Tuesdays at 1pm.

2. SageMath is well documented and offers online help.

3. Search engines may bring you to online forums and give hints on the "How To Do ..." aspects of the course.

4. Be cautious about the output generated by the AI in cocalc ...

Getting Started and Getting Help

Precision

Definition (precision)

The *precision* of a number system is the smallest positive number we can add to one and still make a difference.

Examples:

- A decimal number system with 3 decimal places:

$$1.00 + 0.001 = 1.00 \quad \text{and} \quad 1.00 + 0.005 = 1.01$$

  In this number system, the precision is thus $0.005 = 5 \times 10^{-3}$.

- A binary number system using 3 bits:

$$1.00 + 0.0001 = 1.00 \quad \text{and} \quad 1.00 + 0.001 = 1.01$$

  In this number system, the precision is thus $0.001 = 1 \times 2^{-3}$.

Accuracy

> ### Definition (accuracy)
> The *accuracy* of an approximation is the relative error,
> computed as the absolute value of the difference between the exact,
> nonzero value and the approximation, divided by the exact value.

Example: What is the accuracy of $22/7$ as an approximation for π?

$$\left| \frac{22/7 - \pi}{\pi} \right|$$

- Accuracy is a property of an approximation,
  precision concerns the number system.
- Errors should be computed in a precision at least as high
  as the approximation.