Review Four for the Final Exam

1. Final Exam
   - on Friday 2 August from 2:00pm till 3:40pm
   - focus of this review

2. Calculus, Plotting, and Solving
   - functions, differentiation, integration, series
   - plotting and solving

MCS 320 Lecture 44
Introduction to Symbolic Computation
Jan Verschelde, 31 July 2024

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on Friday 2 August from 2:00pm till 3:40pm

- You must sign up to the exam before noon on Thursday 1 August by sending an email that you commit to taking the exam.
- Without signing up, you will not receive the questions, and your final grade will be an F.
- You must solve the questions on the exam *individually*.
- The exam will have multiple versions of the questions.
- The answers must be uploaded into gradescope
  - in one single Jupyter notebook,
  - before 3:40pm on Friday 2 August 2024.

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Focus of This Review

This is the fourth review, on the second half of the course.

- Look at the review of the second midterm exam.
- The answers to the second midterm exam are posted.
  Even if you took the exam, look at the other version.
- Consider the answers to the quizzes.
- Review the homework problems.

Make sure you understand your mistakes.

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Functions, Differentiation, Integration, Series

Lectures 19 to 25 (3.5 sessions) cover the third part.

- Know the difference between SageMath and Python functions.
- Memoization makes recursion efficient.
- We defined functions to compute expressions.
- The slope of the tangent line at a point on a curve is computed via implicit differentiation or via a linear Taylor series approximation.
- If a symbolic antiderivative does not exist, then we can numerically evaluate a definite integral, except for singularities in the interval.
- A symbolic-numeric factorization works over complex intervals.
- Lagrange multipliers solve constrained optimization problems.

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Plotting and Solving

Lectures 26 to 32 (3.5 sessions) cover the fourth part.

- In two dimensions, we have four different types of plots: explicit, implicit, parametric, and polar plots.
- In three dimensions, we distinguish between surfaces and curves.
- An animation is a list of plots, called frames.
- We solve polynomial equations by triangular forms.
- In linear algebra, we compute matrix factorizations.
- Differential equations occur in mathematical modeling.
- We ended with polyhedral and unconstrained optimization.