MAT 305:
Mathematical
Computing

John Perry

What this class
is about

Computer
programming

Summary

MAT 305: Mathematical Computing
Introduction to Mathematical Computing

John Perry

University of Southern Mississippi

Spring 2016

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Outline

❶ What this class is about

❷ Computer programming

❸ Summary

Outline

1 What this class is about

2 Computer programming

3 Summary

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Summary

Description

Introduction to symbolic mathematical problem solving using computer based systems.

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Description

Introduction to symbolic mathematical problem solving using computer based systems.

- *introduction:* there is a huge world beyond this
- *symbolic:* as opposed to *numeric*
  - exact v. approximate

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Problem solving or programming?

- This class is about mathematics

  - Problem solving
  - (new!) Introduce ideas of higher mathematics:
    matrices, modular arithmetic

- Some problems best attacked with a computer

  - Long
  - Experimentation
  - Repetitive/tedious

- Computers require instructions, called **programs**

- We study *some* programming, but class not about
  programming

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Why program?

- Programming bridges gap between humans, computers
    - Computers don't understand human languages
        - Humans intuitive, poetic; computers literal, mechanical
        - Computers only understand **on** or **off**
    - (Most) humans don't understand a computer's native language
        - Mathematics literal and precise, but (most) humans don't understand it, either!
        - Even the humans that do, prefer not to talk to the computer in that language
- Control over computer
- Deeper understanding of computer technology

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Kinds of computer languages

- Compiled
  - C/C++
  - FORTRAN
  - Go

- Interpreted or scripting
  - BASIC
  - Python
  - Perl

- Mixed ("bytecode")
  - C#(.NET)
  - Java

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Paradigms of computer languages

- Imperative: BASIC, FORTRAN

- Modular: Modula-2

- Object-oriented: Smalltalk

- Functional: Haskell, ML

- Modern (C++, Python) languages blend

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Symbolic systems

- Typically interpreted, but *can* sometimes compile
- We focus on Sage, which mixes both worlds

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- This class about *mathematical* problem solving

- Some programming involved, but that is not the purpose

- Uses programming via Sage