

# Midterm review

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November 9, 2009



- Hand back assignments
- Review comments
- Verify Grading
- Go over solutions
- Collect / photocopy
- Questions

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- Reasonable due date
  - Posting solutions
  - Extra credit for errors in solutions
  - Formatting
  - Questions
- ① Labs 0, 1 & 2 - **NOW**
  - ② Lab 3 - *This week?*
  - ③ Lab 4 - *Next week?*

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- 1 Labs 0, 1 & 2 - on chalk **NOW**
- 2 Labs 3, 4 - after homework due date
- 3 Please read “non-required” solutions as well
- 4 Even if you aced your assignment, please read the posted solutions. This will serve as an “example” of style and possibly show you new “tricks.” Not everything in programming is taught in a lecture. Most understanding comes from reading the work of others.

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- 1 Let me know my mistakes/typos/incomprehensible passages
- 2 The point of TAing (to me) is to learn how to teach, please help by letting me know what works and what doesn't

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## Please

Try to follow the homework submission guidelines, including

- 1 R template
- 2 file naming conventions
- 3 all plots should include your name, assignment number, and the problem number in the `sub=""` position
- 4 More ...

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- Formal
  - 1 Arguments are first *matched* by name
  - 2 Matching is from left to right
- Positional
- Default

- Formal
- Positional
  - 1 Next, unnamed arguments are matched from left to right.
  - 2 The special argument `...` matches *everything*
- Default



- Formal
- Positional
- Default
  - 1 Unmatched arguments with a `arg=value` appearance have defaults
  - 2 If not otherwise matched at this point, arguments are matched with defaults.

- Review

## Calculus for Solving ODEs

- Solving equations using integrating factors
- Product rule
- Chain rule
- Integration by parts / shoelace method
- Sage server (class use ONLY)

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### Sage

`https://rosenbergdm.uchicago.edu:8001/`

**Username:** biomath

**Password:** ABCcty99\$\$

## Derivatives of composites

$$\frac{d}{dt}f(g(t)) = g'(t)f'(g(t))$$



## Basic IBP

$$\int u dv = uv - \int v du$$

- *DETAIL* rule
- Shoelace method / tabular IBP
- Useful for integrating the product of a polynomial and a transcendental function *or* the product of two transcendental functions, one of which is cyclical over differentiation.

- Concept
- Example
- Stability

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- Dangling decimals
  - Unindented source files
  - Code that doesn't parse in *R*
  - Weird de-indentation thing
  - Misuse of scope
  - "Magic numbers"

### Leading zeros

Always write `0.12345...`, never  
`.12345...`

- Dangling decimals
- Unindented source files
- Code that doesn't parse in *R*
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### Indentation

- 1 Not indenting at all is unforgivable
- 2 Inconsistent indentation is almost as bad
- 3 Spaces are *much* better than tabs

- Dangling decimals
- Unindented source files
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### Check your code

Your *R* source for *every* question should run without help in *R*. This means that “non-code” markings in your files should be commented out. Its easy to check your code for typos.



- Dangling decimals
- Unindented source files
- Code that doesn't parse in *R*
- **Weird de-indentation thing**
- Misuse of scope
- "Magic numbers"

### Dangling close-brace

Let me give an example

- Dangling decimals
- Unindented source files
- Code that doesn't parse in *R*
- Weird de-indentation thing
- **Misuse of scope**
- "Magic numbers"

### Lexical scope

It we have time, I'll explain.

- Dangling decimals
- Unindented source files
- Code that doesn't parse in *R*
- Weird de-indentation thing
- Misuse of scope
- “Magic numbers”

### Magic numbers are evil

Whenever possible a function or algorithm should avoid the use of hard-coded, immutable constants.

- NO **vs** No
- Naming collisions
- Long, unparsable “maths”
- Missing plot labels
- Long lines
- Probably more ...

What do you mean, NO?

What makes the most sense?

- NO vs No
- **Naming collisions**
- Long, unparsable “maths”
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- Probably more ...

Namespace collision

Explanation needed.

- NO vs No
- Naming collisions
- Long, unparsable “maths”
- Missing plot labels
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Readability, always

You know who you are

- NO vs No
- Naming collisions
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### Metadata

Plots should stand on their own.

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### Terminal width rule

Lines should never exceed 80 characters in width.



- NO vs No
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- Probably more ...

I'm tired.

I don't think we'll get here



- Work on homework
- Meet individually
- Work through problems together

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