

# Math 3B: Lecture 1

Noah White

September 29, 2017

## Class website

There are a few places where you will find/receive information about Math 3B:

- The class website: [www.math.ucla.edu/~noah](http://www.math.ucla.edu/~noah)
- Email
- Piazza
- CCLE (only for recordings)

## Instructor and TAs

Instructor      Noah White  
*office hours*    *MS 6304, Thursday 10-11:30am, Friday 9:30-11am*

TA                Bohyun Kim  
*office hours*    *TBA, TBA*

Kevin Miller  
*TBA, TBA*

Ryan Wallace  
*TBA, TBA*

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- Learning assistants will be available on Piazza
- They will also host study sessions
- Connie, Jayesh, Jennifer, Kelsey, and Nick will be a fantastic resource for you this quarter.

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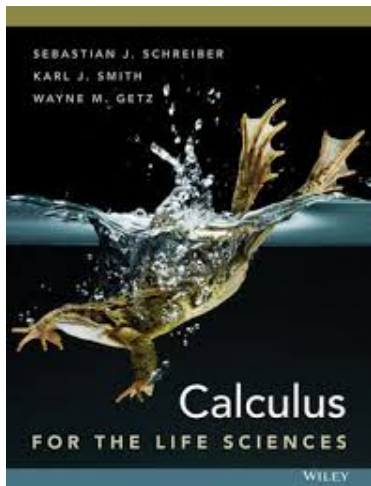
- The lectures will be recorded.
- The recordings will be available on CCLE
- Study tip: doing problems is much better than watching a video!

# Communication

- Mathematical questions should be asked on Piazza
- Administrative questions should be directed to your TA initially
- If you need to email me include `math3b` in the subject

# Textbook

S. J. Schreiber, *Calculus for the Life Sciences*, Wiley



# Problem sets, homework, and quizzes

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## Quizzes

Administered in discussion session in weeks 3, 6, 10. More on the format to come.

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  - write up your own solutions, in your own words.

# Exams

There will be two midterms and a final exam

- **Midterm 1** 8-8:50am Monday, 23 October, 2017

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- **Final** 8-11am Wednesday, 13 December, 2017

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## Cheatsheets and calculators

You will be allowed a small cheatsheet in each exam. Must be self-written and one side, half a letter size piece of paper. You are also allowed to use non-programmable, non-graphing calculators.

# Grading

Your final grade will be calculated using the maximum of the following two grading schemes.

*10% (best 4 quizzes/hw) + 40% (midterms) + 50% (final)*

or

*10% (best 4 quizzes/hw) + 30% (best midterm) + 60% (final)*

# Schedule

See website

# Where to get help

## Piazza

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## Student Math Center (SMC)

Location: MS 3974, times: M-R 9am-3pm.

The SMC offers free, individual and group tutoring for all lower division math courses. This service is available on a walk-in basis; no appointment is necessary. Students may ask any of the TAs in attendance for assistance with math problems.

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- Definitions and properties of basic functions.
- How to calculate limits.
- You should have a good feel for what the derivative means.  
I.e. derivative at a point = tangent slope.
- You need to understand differentiation algebraically **as well as** geometrically.
- You should also know the definition of the derivative

$$\frac{d}{dx}f(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

# Differentiation

You should be able to differentiate many of the standard functions we will see in this course. This includes:

- polynomials/power functions

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- trig functions

$$\frac{d}{dx} (\sin x) = \cos x$$



## Product rule

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Let's differentiate the function  $f(x) = e^x \sin x$ .

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$$f'(x) = e^x \cos(e^x)$$

# The quotient rule sucks

The quotient rule says

$$\frac{d}{dx} \left( \frac{g(x)}{h(x)} \right) = \frac{g'(x)h(x) - g(x)h'(x)}{h(x)^2}$$

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The quotient rule says

$$\frac{d}{dx} \left( \frac{g(x)}{h(x)} \right) = \frac{g'(x)h(x) - g(x)h'(x)}{h(x)^2}$$

This is annoying to remember (where does that minus sign go again?). Luckily we can notice

$$\frac{g(x)}{h(x)} = g(x)k(x) \quad \text{where} \quad k(x) = (h(x))^{-1}$$

So we can just use the product rule!

## Example

Question

Differentiate

$$f(x) = \sin \frac{1}{x}$$

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### Solution

We should use the chain rule. Notice  $f(x) = g(h(x))$  where

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so

$$\begin{aligned} f'(x) &= h'(x)g'(h(x)) \\ &= -\frac{1}{x^2} \cos(x^{-1}) \end{aligned}$$



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$$f(x) = \frac{x-1}{x+1} = (x-1)(x+1)^{-1}$$

### Solution

We should use the product/quotient rule. Notice  $f(x) = g(x)h(x)$  where

$$h(x) = (x+1)^{-1} \quad \text{and} \quad g(x) = x-1$$

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$$\begin{aligned} f'(x) &= g'(x)h(x) + g(x)h'(x) \\ &= \frac{1}{x+1} - \frac{x-1}{(x+1)^2} = \frac{2}{(x+1)^2} \end{aligned}$$

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We should notice that  $F(x) = f(g(x))$  so we can use the chain rule!

$$f(x) = \frac{x - 1}{x + 1} \quad \text{and} \quad g(x) = \sin x^2$$

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$$\begin{aligned} F'(x) &= g'(x)f'(g(x)) \\ &= 2x \cos x^2 \frac{2}{(\sin x^2 + 1)^2} \end{aligned}$$