

# MATH 1131Q CALCULUS 1



# MATH 1131Q - Calculus 1.

Álvaro Lozano-Robledo

Department of Mathematics  
University of Connecticut



Day 1

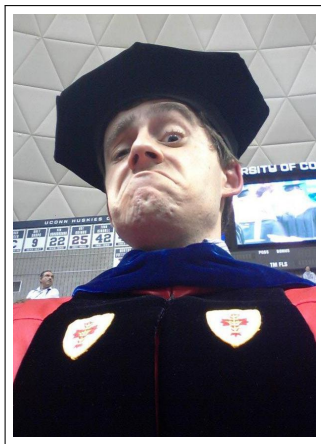
# About your instructor

**EMAIL: UCONNALCPROF@GMAIL.COM**

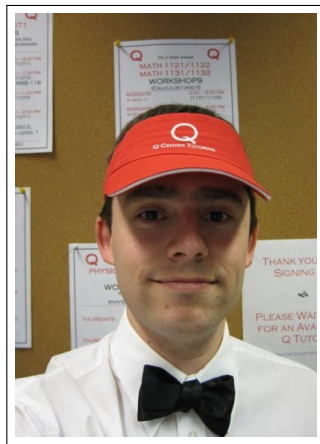


**Álvaro Lozano-Robledo**

# Your instructor wears two hats at UConn...



Associate Professor  
of Mathematics



Director of the Q  
Center

## Your Teaching Assistants:

- Guojun Cao
- Jessica Ginepro
- Melissa Haire
- Jieun Lee
- Tze-Chun Ou
- Francesca Romano

**NOTE ROOM CHANGE:** Section 90D (MW 8-8:50) with Jieun Lee will meet in GENTRY 425 from now on.

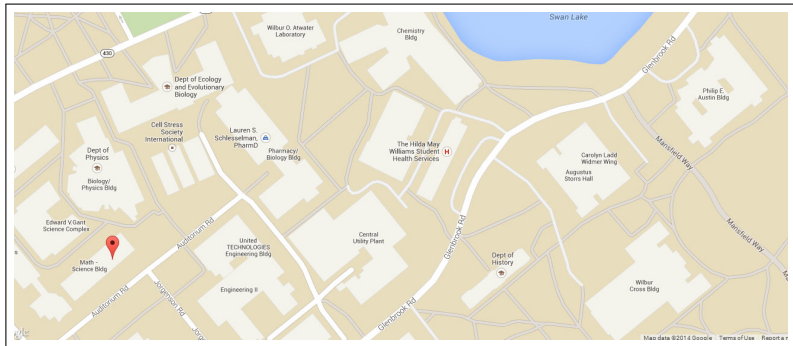
**Álvaro's office hours:** Tuesdays 10-11am and Thursdays 11-12pm, at MSB 312.

Your TAs office hours:

- Guojun Cao: Mondays 10am-1pm, in MSB 118.
- Jessica Ginepro: Mondays 2-4 PM and Wednesdays 3-4 PM in Room 117.
- Melissa Haire: Mondays from 1:30-3 pm and on Thursdays from 12:30-2 pm in MSB 119.
- Jieun Lee: Tuesdays and Thursdays 3:25 - 4:55 PM in MSB 117.
- Tze-Chun Ou: Fridays 10:00 am - 1:00 pm in MSB 301.
- Francesca Romano: Mondays 2:25 - 3:25 and Tuesdays, and Thursdays 3:30 - 4:30, in MSB 117.

# I'm so lost on campus... Where is MSB??

But... Where is MSB?  
Math-Sciences Building



# About this class: MATH 1131Q - Calculus 1

- Our Website for Section 080.

<http://alozano.clas.uconn.edu/math1131f14/>

- Main Website for all MATH 1131Q lectures.

<http://www.math.uconn.edu/ClassHomePages/Math1131/math1131f14/>



- Grading:
  - Exams (75%),
  - Quizzes and Worksheets in Discussion Sections(10%)
  - Online homework in MyMathLab (5%),
  - Online and paper quizzes (5%),
  - Class participation with clickers, your vocal cords (5%).

# About this class: MATH 1131Q - Calculus 1

Things you need to do:

- 1 Register to do homework with WebAssign at

Husky CT: [learn.uconn.edu](http://learn.uconn.edu)

- 2 Attend your discussion sections.

- 3 Register your iClicker at

<http://www1.iclicker.com/register-your-remote/register-clicker/>

- Select “NO” for the question about Learning Management Systems.
- Use your Net ID as your “Student ID”
- Remember to double check you Remote ID is correct.

- 4 Learn Calculus!

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- 5 Profit!

# Studying for this class



How to study for this course:

- 1 Attend lecture and discussion class.
- 2 Read the explanations and examples in the textbook.
- 3 Do online homework sets and quizzes.
- 4 Go to office hours and ask questions to your instructor and TA.
- 5 Look for help at the Q Center.
- 6 Tackle problems using Polya's "How To Solve It" problem solving strategy chart.

## HOW TO SOLVE IT

### UNDERSTANDING THE PROBLEM

**First.**

You have to *understand* the problem.

*What is the unknown? What are the data? What is the condition?* Is it possible to satisfy the condition? Is the condition sufficient to determine the unknown? Or is it insufficient? Or redundant? Or contradictory?

Draw a figure. Introduce suitable notation.

Separate the various parts of the condition. Can you write them down?

### DEVISING A PLAN

**Second.**

Find the connection between the data and the unknown.  
You may be obliged to consider auxiliary problems if an immediate connection cannot be found.  
You should obtain eventually a *plan* of the solution.

Have you seen it before? Or have you seen the same problem in a slightly different form?

*Do you know a related problem?* Do you know a theorem that could be useful?

*Look at the unknown!* And try to think of a familiar problem having the same or a similar unknown.

*Here is a problem related to yours and solved before. Could you use it?* Could you use its result? Could you use its method? Should you introduce some auxiliary element in order to make its use possible?

Could you restate the problem? Could you restate it still differently? Go back to definitions.

If you cannot solve the proposed problem try to solve first some related problem. Could you imagine a more accessible related problem? A more general problem? A more special problem? An analogous problem? Could you solve a part of the problem? Keep only a part of the condition, drop the other part; how far is the unknown then determined, how can it vary? Could you derive something useful from the data? Could you think of other data appropriate to determine the unknown? Could you change the unknown or the data, or both if necessary, so that the new unknown and the new data are nearer to each other? Did you use all the data? Did you use the whole condition? Have you taken into account all essential notions involved in the problem?

### CARRYING OUT THE PLAN

**Third.** Carrying out your plan of the solution, *check each step*. Can you see clearly that the step is correct? Can you prove that it is correct?  
*Carry out* your plan.

### LOOKING BACK

**Fourth.** Can you *check the result*? Can you check the argument? Can you derive the result differently? Can you see it at a glance? Can you use the result, or the method, for some other problem?  
*Examine* the solution obtained.



There are additional study resources at

<http://mathresources.uconn.edu/math1131>

- 1 Watch videos. Each video last 8-15 minutes and covers some of the difficult and/or critical concepts.
- 2 Revisit concept questions.
- 3 Review using flash cards.

# Your first homework assignments and quizzes

## WebAssign due dates...

- JS Section 1.1 and 1.2, due 8-29-14, 11:59 PM EDT
- JS Section 1.1 and 1.2 Quiz, due 8-30-14, 11:59 PM EDT
- JS Section 1.3 and 1.5, due 9-2-14, 11:59 PM EDT
- JS Section 1.3 and 1.5 Quiz, due 9-2-14, 11:59 PM EDT
- JS Section 1.6, due 9-2-14, 11:59 PM EDT
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## **Algebra Exam (Review!):**

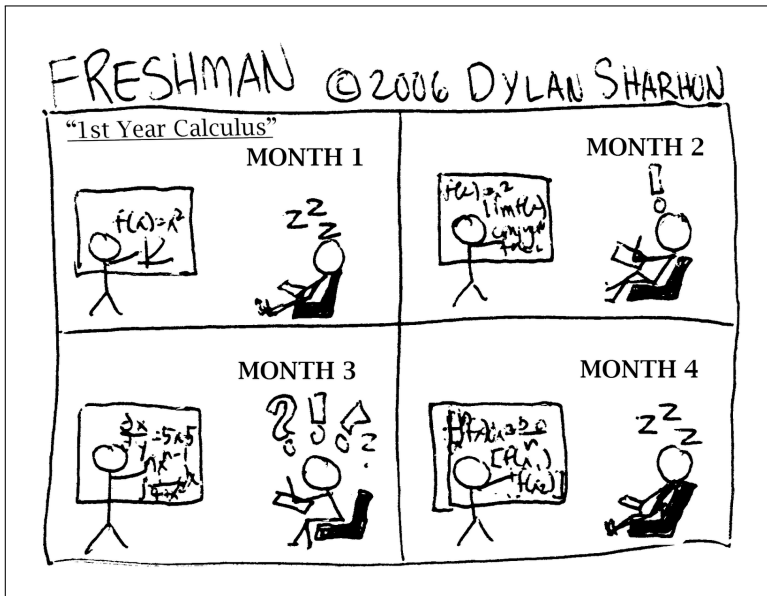
- You have 90 minutes to solve 33 questions!
- You have two weeks to do this
- Do it before Add and Drop Date, Monday, September 8th.



The Q Center is offering some basic review sessions, focusing on exponentials and logarithms, and trigonometry. These will be run by Q Center graduate assistants from the Math department and the School of Education, and take place in Room EC1 at Level 1 of the Homer Babbidge Library.

- Wed, 8/27, “Log and Exp”, 3:30-4:30 pm, Room EC1, by Nehal.
- Wed, 8/27, “Log and Exp”, 7:30-8:30 pm, Room EC1, by David.
- Thu, 8/28, “Trig”, 11 am- noon, Room EC1, by Steve.
- Thu, 8/28, “Trig”, 7-8 pm, Room EC1, by Shawnee.
- Fri, 8/29, “Trig”, 2:30-3:30 pm, Room EC1, by Marissa.

# Studying for this class... Beware of pace!



# Let's test your clickers!

To set your clicker frequency: press and hold the power button for two seconds. Use A-E to enter the two letter frequency code.

## Set your clicker frequency to

Handwritten blue text 'DD' representing the frequency code.

# Testing your clickers: Question 1



DD

Who are these ladies giving the president “bunny ears”?

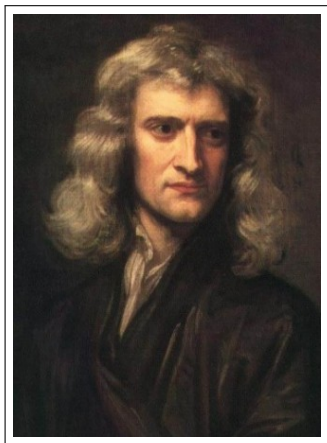
- (A) Kardashians
- (B) A new crop of promising NASA entry-level scientists
- (C) Ice-bucket challenge winners
- (D) A winning sports team
- (E) The cast of MTV’s “The Real World: Washington, D.C.”



President Barack Obama posing for a photo after he received a jersey and basketball from the team during an event in honor of the 2014 NCAA Women's Basketball Champions, the UConn Huskies, in the East Room of the White House on June 9.



## Testing your clickers: Question 2



Who is (was) this guy?

- (A) Galileo Galilei
- (B) George Washington
- (C) Isaac Newton
- (D) Benjamin Franklin
- (E) Nostradamus

# Gottfried Wilhelm Leibniz



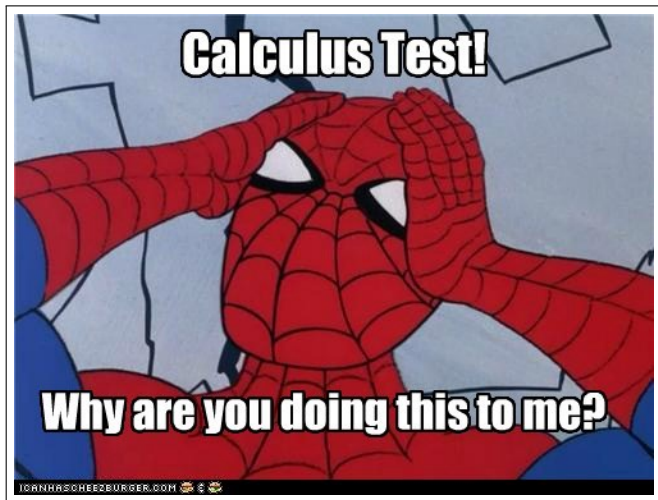
## Testing your clickers: Question 3

How do you feel about Mathematics?

- (A) ♥ I **LOVE** math ♥
- (B) I like math, but I am not in love with it.
- (C) It's complicated. Math and I have a love/hate relationship.
- (D) I do not like math, and yet, here I am.
- (E) Math makes me *physically ill!*

# WHY CALCULUS?

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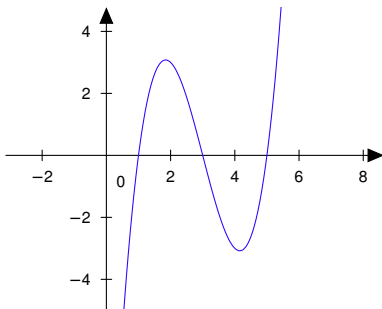


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- Calculus is used in every branch of the physical sciences, actuarial science, computer science, statistics, engineering, economics, business, medicine, demography, and in other fields wherever a problem can be mathematically modelled.
- *It builds character.* Actually, it builds a structured way of thinking that is very useful in technical fields.

# Two Fundamental Concepts

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# Two Fundamental Concepts

There are two fundamental concepts in Calculus:

- 1 The concept of **limit** of a sequence of numbers, and
- 2 The concept of **derivative** (or **rate of change**) of a function.

Let's see examples that illustrate these concepts.

# An Example: What is $\pi$ ?

## Question

What is  $\pi$ ?

Ratio of the circumference of a circle to its diameter.

$$\frac{2\pi R}{2R}$$

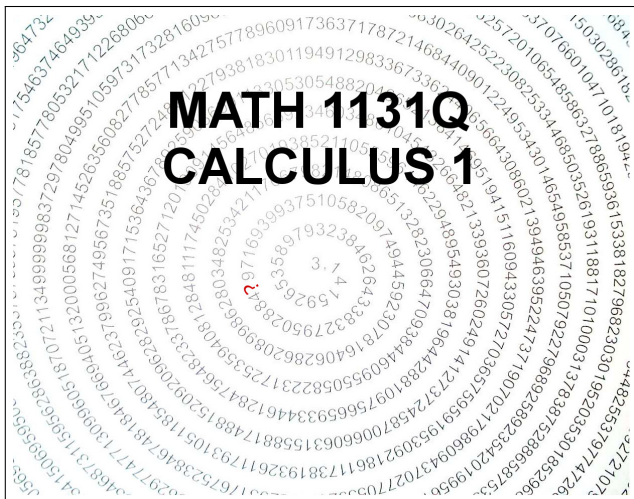
so  $\frac{2\pi R}{2R} = \pi$

3.1415926535846264  
950227...

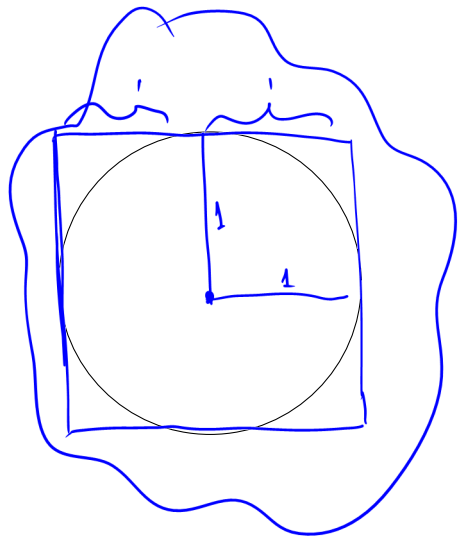
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## Question

What is  $\pi$ ? How do you calculate digits of  $\pi$ ?



# An Example: What is $\pi$ ?



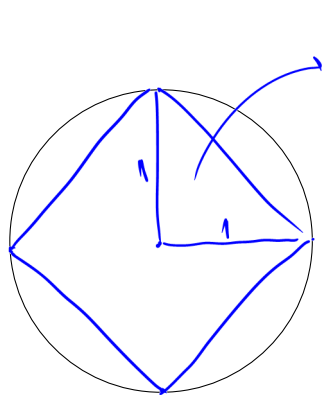
$$\text{Area of sq: } 2 \times 2 = 4$$

$$\text{Area of circ: } \pi R^2 = \pi \cdot 1^2 = \pi$$

$$\Rightarrow \pi < 4$$



# An Example: What is $\pi$ ?



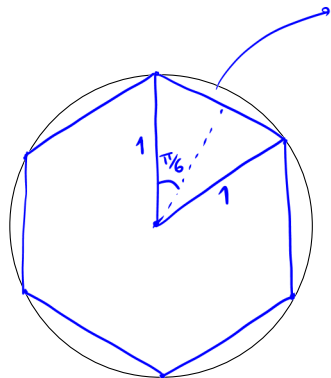
$$\text{Area of triang: } \frac{1 \cdot 1}{2} = \frac{1}{2}$$

$$\text{Area of sq: } 4 \times \frac{1}{2} = 2$$

$$\Rightarrow 2 < \pi$$

$$\text{So } 2 < \pi < 4$$

# An Example: What is $\pi$ ?



Trigonometry:

$$\frac{1}{2} = \sin \frac{\pi}{6} = \frac{x}{1} \Rightarrow x = \frac{1}{2}$$

$$\frac{\sqrt{3}}{2} = \cos \frac{\pi}{6} = \frac{h}{1} \Rightarrow h = \frac{\sqrt{3}}{2}$$

$$\text{Thus, area of Triangle} = \frac{(2x) \cdot h}{2} = xh = \frac{1}{2} \cdot \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{4}$$

$$\text{Area of Hexagon} = 6 \cdot \frac{\sqrt{3}}{4} = \frac{3\sqrt{3}}{2} \approx 2.598076 \dots$$

Hence

$$\pi > \frac{3\sqrt{3}}{2} \approx 2.598076 \dots$$