Math 1300: Calculus I **Fall 2020**

Lecture 1: Welcome!

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Today's Goal: Introduction to the course! Getting to know the technologies and humans.

1.1 Introduction

Welcome to Calculus I! Please take a minute to rename yourselves with your name and pronouns.

For many of your, it's pretty disappointing to be starting out your university career with so much online, but I can offer you the bright side: The Calculus curriculum has been updated very gently every year for the past...million years. These efforts have been towards improving an old system, not towards utilizing new technology to create a better course overall. We had a pretty good in-person calculus course curriculum, but moving online has given a lot of people a push: A push towards new technologies, towards re-constructing calculus in a way that is more beneficial to students. In this class, we will be using Desmos and OneNote to do activities and share notebooks. We will also be using Canvas to submit written assignments like homework - for this you'll need a scanner app: Only .pdf's will be accepted - please use a scanner app. Many smartphones have a document scanner through their "Notes" app, and GeniusScan or CamScanner are good free options.

1.2 Who am I?

- I'm a fifth year graduate student at CU. My work is in Number Theory, and more specifically I work on problems related to post-quantum cryptography.
- Before coming to CU for grad school, I lived in New York where I taught at CUNY Hunter College as a lecturer.
- I have a pretty dry sense of humor.
- I have an adorable cat (try to find Lily to show on screen).
- In my spare time, I enjoy dance and I'm learning how to do a handstand.

1.3 Read through syllabus with students

1.4 Our Class

I plan to 'lecture' on our class days, but these lectures will never take the whole class - there will always be examples for you to work through on your own and small group work. I appreciate questions - please interrupt with tons of questions! Using either the microphone or the chat.

I have made the decision *not* to record our lectures. This is due to privacy concerns, and also there are lecture videos available through Canvas.

I will have my notes available on my website, which is:

`http://math.colorado.edu/~saar7867/`

If you are looking at my lecture notes and still need more explanation, I suggest Paul's Online Math Notes:

`https://tutorial.math.lamar.edu/classes/calci/calci.aspx`

If you are looking for more practice problems with solutions, you can get worksheets from Kuta Software (warning: these problems vary in level, but most of them are on the 'easy' side):

`https://www.kutasoftware.com/freeica.html`

The MARCO is also a good resource- it's our Mathematics Academic Resource Center Online! Almost all of the tutors there are at the level of tutoring Math 1300, so please visit them. These are people waiting in Zoom rooms (linked on the MARCO website) from 9am - 9pm most evenings. Take advantage of this resource! I have a MARCO hour (Wednesday 2pm - 3pm), and our TA also has a number of hours (see the schedule), but you should feel free to stop in with any tutor. It's good to hear explanations from multiple people - we all have a slightly different take!

`https://math.colorado.edu/marc/`

For my office hour, I am thinking of Tuesday at 11 am? If that works for everyone? I'm also available after class quite frequently, and if you give me some notice I'm happy to work with your schedule to set up a time to meet. All office hours are on Zoom - we can use our classroom link for office hours.

I have made us a classroom Discord server! (Put an invite link in the chat!) This is optional, but it's a good way to connect with other students in the class, do homework "together", and ask questions to each other and me! I'll keep an eye on it as much as I can. It's an experiment - let's see how it goes!

1.5 Trig Review

Here's a comprehensive review: `https://math.usask.ca/maclean/298/BW/trigreview.pdf` Pages 1 - 12, 15 are the most important. Trig won't come up right away in Calculus, but you will be thanking yourself later if you remind yourself of it regularly starting now.

One of the best things you can do for yourself is memorize certain values of the sine and cosine functions. These functions are amazing - they can be thought of as coordinates on the unit circle or ratios of right triangles - but quick recall is valuable. You don't want remembering the value of a trig function to stop your workflow on a problem. There is a quick way to create a chart of values for yourself - do this often! At the beginning of class, at the beginning of a quiz, when you start your homework, etc.

Start out with a blank grid, pay attention to the order of the functions and angles:

Degrees:	0	30	45	60	90
Radians:	0	$\frac{\pi}{6}$	$\frac{pi}{4}$	$\frac{\pi}{3}$	$\frac{pi}{2}$
$\sin(\theta) =$					
$\cos(\theta) =$					

Fill in the sin row with $\frac{}{2}$:

Degrees:	0	30	45	60	90
Radians:	0	$\frac{\pi}{6}$	$\frac{pi}{4}$	$\frac{\pi}{3}$	$\frac{pi}{2}$
$\sin(\theta) =$	$\frac{}{2}$	$\frac{}{2}$	$\frac{}{2}$	$\frac{}{2}$	$\frac{}{2}$
$\cos(\theta) =$					

And for the numerators, just count up from 0, inside of square roots:

Degrees:	0	30	45	60	90
Radians:	0	$\frac{\pi}{6}$	$\frac{pi}{4}$	$\frac{\pi}{3}$	$\frac{pi}{2}$
$\sin(\theta) =$	$\frac{\sqrt{0}}{2}$	$\frac{\sqrt{1}}{2}$	$\frac{2}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{4}}{2}$
$\cos(\theta) =$					

Now reduce the fractions! The cos row is the sin row backwards:

Degrees:	0	30	45	60	90
Radians:	0	$\frac{\pi}{6}$	$\frac{pi}{4}$	$\frac{\pi}{3}$	$\frac{pi}{2}$
$\sin(\theta) =$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos(\theta) =$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0

Add a row for tangent! Since $\tan\theta = \frac{\sin\theta}{\cos\theta}$, we can just divide the rows. Since the denominators are the same, this amounts to just dividing the numerators of these fractions:

Degrees:	0	30	45	60	90
Radians:	0	$\frac{\pi}{6}$	$\frac{pi}{4}$	$\frac{\pi}{3}$	$\frac{pi}{2}$
$\sin(\theta) =$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos(\theta) =$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan(\theta) =$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	DNE

Note: Most of the time we rationalize denominators to write $\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$.

Degrees:	0	30	45	60	90
Radians:	0	$\frac{\pi}{6}$	$\frac{pi}{4}$	$\frac{\pi}{3}$	$\frac{pi}{2}$
$\sin(\theta) =$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos(\theta) =$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan(\theta) =$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	DNE