## Welcome to MAT137!

- Hi! My name is Qin (pronounced 'Chin').
- Email: qin.deng@mail.utoronto.ca
- Office hours: WF 4-5 on the lecture Zoom link
- Website for lecture slides: http://www.math.toronto.edu/dengqin
- Everything else will be posted on Quercus.
- Homework: Enrol in a tutorial \&


## Watch videos 7-15 on Playlist 1

- Problem set $\mathbf{1}$ has been posted under Modules: Problem Sets. It is due on Wednesday May 13th at noon on Gradescope.


## Some Propaganda Part 1: Go to your tutorials!

Performance in MAT137Y as a function of tutorials attended


## Some Propaganda Part 2: Do your homework!

Performance in MAT137Y as a function of problem sets submitted (2017-2018)
$\square \mathrm{F} \square \mathrm{D} \square \mathrm{C} \quad \square \mathrm{B} \square \mathrm{A}$


## Philosophy of the course

(1) This class is in inverted format. It's critical that you watch the assigned videos before coming to class.
(2) We focus on understanding not memorization.
(3) This is a calculus class. But first and foremost, this is a logic and critical thinking class.
(9) This is going to be a tough course for many of you. Be prepared to work hard and build habits!
(5) Don't be afraid to ask questions or be wrong in class. I'm not here to judge you.

## Sets: warm-up

What are the following sets?

- $(2,4] \cup(3,5]$
© $(-\infty, 4] \cap[3, \infty)$
- $[4,2)$
- $(0,0)$
- $[0,0]$


## Set description

What are the following sets?

- $\left\{x \in \mathbb{N}: x^{2}<6\right\}$
- $\left\{x \in \mathbb{Z}: x^{2}<6\right\}$
- $\left\{x \in \mathbb{R}: x^{2}<6\right\}$


## Set description

What are the following sets?

- $\{x \in \mathbb{R}: \forall y \in[0,1], x<y\}$
(2) $\{x \in \mathbb{R}: \exists y \in[0,1]$ s.t. $x<y\}$
- $\{x \in[0,1]: \forall y \in[0,1], x<y\}$
- $\{x \in[0,1]: \exists y \in[0,1], x<y\}$
- $\{x \in[0,1]: y \in[0,1], x<y\}$
- $\{x \in[0,1]: \exists y \in \mathbb{R}$ s.t. $x<y\}$


## New set operations: Set difference

Given two sets $A$ and $B$. We define
$A \backslash B:=\{x \in A: x \notin B\}$. This set is called " A minus B ".
What are the following sets?

- $[0,1] \backslash(-0.5,1)$
- $[0,1] \backslash(1, \infty)$
- $\mathbb{R} \backslash[0,1]$
- $[0,1] \backslash \mathbb{R}$


## Polling

(1) $A:=\{$ Students currently in Ontario $\}$

- $B:=\{$ Students who like cats more than dogs\}
- $C:=\{$ Students who like math $\}$

Are you in $(A \backslash B) \cup(B \backslash A)$ ?

## Polling

(1) $A:=\{$ Students currently in Ontario $\}$

- $B:=\{$ Students who like cats more than dogs\}
- $C:=\{$ Students who like math $\}$

Are you in $C \backslash(B \backslash C)$ ?

## Set description: even integers

Let $S$ be the set of even integers. Which of the following is the correct set-building notation for $S$ ?

- $\{x \in \mathbb{Z}: \forall n \in \mathbb{Z}, x=2 n\}$
- $\{x \in \mathbb{Z}: \exists n \in \mathbb{Z}$ s.t. $x=2 n\}$

Here are somethings you can do if you are not sure:
(0) Try saying the set-building notation in English. (ex. it's the set of all integers $x$ s.t. ... )
(2) Check if 2 is in each of the sets.

## Set description: rational numbers

## Let $S$ be the set of rational numbers. Write $S$ in set-building notation.

## Negation intro

The negation of a logic statement is a statement which is false in every scenario where the original is true and true in every scenario where the original is false.

What is the negation of the statement "every student attending this Zoom meeting is wearing red"?

## Negation, more examples

Negate the following statements.
(1) Every math student at UofT has a cellphone.
(2) There is a country in the European Union with fewer than 1000 inhabitants.

- I like math and physics.
- Everyone in this class likes math and physics.


## Homework: Negation, a harder example

## Negation example

Negate "Every page in this book contains at least one word whose first and last letters both come alphabetically before M".

Hint: Try re-writing this sentence with a clause for each quantifier. For example, re-write this sentence starting with "For every page in this book, ... ". After you do this, negate systematically.

