

MAT137

(Section L0501, September 23, 2019)

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Office hours	Thursdays 4-6, PG003
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Don't forget!

- Course website: <http://uoft.me/MAT137>
- Webpage for this section:
<http://www.math.toronto.edu/ssarkar/137.html>
- **For next day's lecture, watch videos 2.5, 2.6, 2.7, 2.8 (and 2.9)**
- Today's lecture will **assume** you have watched videos 2.1, 2.2, 2.3.

Let's get started!!

Topics: absolute value and distance, intuitive idea of limit

What is wrong with the following description of proof by induction?

A proof by induction has 3 parts:

- ① Base case: Prove the statement is true for 1 (for example)
- ② Induction hypothesis: Show the statement is true for n .
- ③ Induction step: Prove the statement is true for $n + 1$.

Properties of inequalities

Let $a, b, c \in \mathbb{R}$. Assume $a < b$.
What can we conclude?

① $a + c < b + c$

② $a - c < b - c$

③ $ac < bc$

4. $a^2 < b^2$

5. $\frac{1}{a} < \frac{1}{b}$

Sets described by distance

Let $a \in \mathbb{R}$. Let $\delta > 0$.

What are the following sets? Describe them in terms of intervals.

① $A = \{x \in \mathbb{R} : |x| < \delta\}$

② $B = \{x \in \mathbb{R} : |x| > \delta\}$

③ $C = \{x \in \mathbb{R} : |x - a| < \delta\}$

④ $D = \{x \in \mathbb{R} : 0 < |x - a| < \delta\}$

Implications

Find *all* values of A , B , and C that make the following implications true

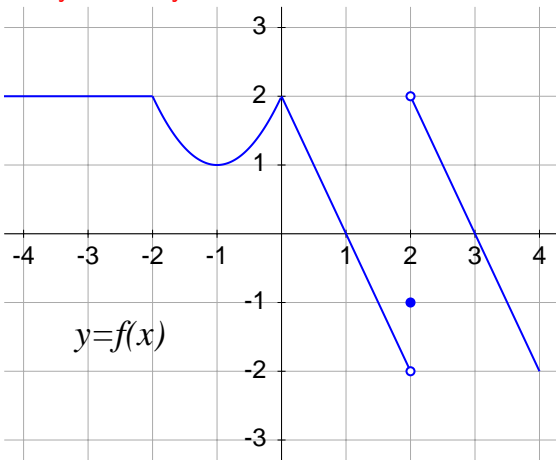
$$\textcircled{1} \quad |x - 3| < 1 \implies |2x - 6| < A$$

$$\textcircled{2} \quad |x - 3| < B \implies |2x - 6| < 1$$

$$\textcircled{3} \quad |x - 3| < 1 \implies B < |x + 5| < C$$

Limits from a graph

Solve (3) and (4) as homework. Let me know on Wednesday if you have any difficulty.



Find the value of

- ① $\lim_{x \rightarrow 2} f(x)$
- ② $\lim_{x \rightarrow 0} f(f(x))$
- ③ $\lim_{x \rightarrow 2} [f(x)]^2$
- ④ $\lim_{x \rightarrow 2} f(2 \sec x)$