

Lecture Slides for Wednesday Sept. 13 and Thursday Sept. 14

From last time:

1.  $\forall x \in \mathbb{R}, x > 0, x < 0, \text{ or } x = 0.$   
 $\exists x \in \mathbb{R}, x > 0, x < 0, \text{ or } x = 0.$
2.  $\exists x \in \mathbb{R}, \exists n \in \mathbb{N}, \text{ such that } x = 2n + 1.$
3.  $\exists A \subset \mathbb{N}$  such that  $0 \in A.$

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Let  $T$  be the set of people in this room and  $S(x,y)$  represent the phrase “ $x$  studies with  $y$ ”. Using  $T, \in, S(x,y), \forall, \exists,$  and  $x, y,$  etc. to represent people, rewrite the following statements:

1. Everyone has a study partner.
2. One person studies with everyone.
3. Everyone studies with everyone else.
4. At least two people study together.
5. There are two people who have the same study partners

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How do we disprove...

1. Everyone in this room prefers writing with pens over pencils.
2. Someone in this room has never used a computer.

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Write the negation of the following:

1. Every student in this room studies math.
2. There is a province in Canada with fewer than 1000 inhabitants.
3. You play hockey and basketball.
4. Every building on campus contains a classroom with no windows.
5. If it rains, then I bring an umbrella.
6. If it rains, then everyone brings an umbrella.

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### Logical Equivalence

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### Negating a conditional

A company claims the following:

If you correctly answer the skill-testing question, you will win a prize.

Did the company lie if..

- You answer the question incorrectly and do not win the prize?
- Everyone wins a prize, regardless of their answer?
- You answer correctly and do not win a prize?

Which line of the truth table corresponds to each of the above questions?

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Define “the set of odd numbers” and “the set of even numbers”. (Write both definitions separately.)

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Write a statement that is logically equivalent to the following statements without using the words “not”, “nor”, “neither”. Try using as many math symbols as possible.

1. It is not the case that every positive integer is smaller than a number that is not odd.
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For next time:

- Finish watching Playlist 1
- Start Problem Set 1
- Attend tutorial