Practice Lecture

Start: 4:10 pm

(to allow for technical difficulties)

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* All lectures will be on zoom, at scheduled time.
* Same holds for OH.
* HW as before changed weights.
* Exam will be given online, submitted electronically. same time as scheduled.

Problem 5, Midterm 1

a) Prove that if $A \subset B$ then $P(A) \subset P(B)$.

Problem 3 [illegible]

a) Prove that if $A \subset B$ then $P(A) \subset P(B)$.

Solution

Scratch Work

First write down relevant definitions.

* $P(A)$ means "set of all subsets of A"

More precisely:

"$X \in P(A) \iff X \subset A$"

* $A \subset B$ means "$a \in A \Rightarrow a \in B$"

Attempt at ~~proof~~:

Suppose $A \subset B$.

Want to show $P(A) \subset P(B)$

This is equivalent to showing

using defn of $\subset$ "$X \in P(A) \implies X \in P(B)$"

Suppose $X \in P(A)$

then $X \subset A$ by defn of $P(A)$

So $X \subset B$. using "$X \subset A$, $A \subset B$, then $X \subset B$"
(proved in lecture!)

So $X \in P(B)$ using definition of $P(B)$.

QED.

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problem 5b) Midterm I

Give examples of sets A, B for which

$$P(A) \cup P(B) \neq P(A \cup B)$$

Solution I

$A = \{3, 7, 8\}$

$B = \{1, 2, 4\}$

$A \cup B = \{1, 2, 4, 3, 7, 8\}$

$P(A) = \{\emptyset, \{7\}, \{3\}, \ldots\}$

$P(B) = \{\emptyset, \{1\}, \{2\}, \{2, 4\}, \ldots\}$

$P(A \cup B) = \{\{1, 2\}, \emptyset, \ldots\}$

$P(A) \cup P(B) = \{\emptyset, \{7\}, \{3\}, \{1\}, \{2\}, \ldots\}$

This is overcomplicated.

1) Don't choose complicated A, B.
Be lazy.

$A = \{0\}$
$B = \{1\}$

$A \cup B = \{0, 1\}$

$P(A) = \{\phi, \{0\}\}$
$P(B) = \{\phi, \{1\}\}$
$P(A \cup B) = \{\phi, \{0, 1\}, \{1\}, \{0\}\}$
$P(A) \cup P(B) = \{\phi, \{0\}, \{1\}\}$.

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2) Save work by using defⁿ.

What does it mean for 2 sets to be equal?

* "same elements"

* $A = B$ means $a \in A \Leftrightarrow a \in B$

Soln 2

Let $A = \{0\}$

$B = \{1\}$

$A \cup B = \{0, 1\}$.

$\{0,1\} \in \underline{P(A \cup B)}$. because $\{0,1\} \subset A \cup B$

but

$$\left.\begin{array}{l} \{0,1\} \notin P(A) \\ \text{and} \\ \{0,1\} \notin P(B) \end{array}\right\} \Leftarrow \{0,1\} \notin \underline{P(A) \cup P(B)}$$

$\boxed{\mathbb{Z}}$

* Highly recommend webcam + microphone.