Math 55 Lecture 4, §2.1, 2.2, 2.3

Def: A set is an unordered collection of objects.

Write $a \in A$ to mean
$a \notin A$ " "

Ex:

Ex: $\mathbb{N} = \{0, 1, 2, 3, \ldots\}$,
$\mathbb{Z} = \{\ldots, -2, -1, 0, 1, 2, \ldots\}$,
$\mathbb{Z}^+ = \{1, 2, 3, \ldots\}$
$\mathbb{Q} =$
$\mathbb{R} =$

Ex:

Def: Two sets are equal if and only if

Venn diagrams :

Def: Set A is a subset of B iff

A is <u>proper</u> subset of B if

<u>Q</u>: What does $A \subseteq B$ look like as Venn diagram?

<u>Def</u>: The set with no elements is called

However, $\{\phi\}$

<u>Def</u>: Let S be a set. If there are exactly n distinct elements in S where n is non-neg integer, we say S is

<u>Def</u>: A set is said to be <u>infinite</u> if

New sets from old (power set, Cartesian product)

Def: Given a set S, the power set $P(S)$ of S is

Ex:

Def: The ordered n-tuple $(a_1, a_2, \dots, a_n)$ is

Def: Let A and B be sets. The Cartesian product of A and B, denoted by $A \times B$, is

Can also define $A_1 \times \dots \times A_n$,

Ex:

§ 2.2 Set operations

Def: Let A, B be sets. The union of sets A, B, denoted $A \cup B$, is

Ex:

Def: Let A, B be sets. The intersection of A and B, denoted $A \cap B$, is

Def: Two sets are <u>disjoint</u> if

Def: Let A, B be sets. The difference of A and B, denoted $A - B$, is

Def: Let U be the "universal set," i.e. the set of

Ex:

Set identities

Note: To prove $C = D$ (C and D sets), prove

① and ②

Ex: Prove that $\overline{A \cup B} = \overline{A} \cap \overline{B}$

To prove this, we will show ① $\overline{A \cup B} \subseteq \overline{A} \cap \overline{B}$ and

② $\overline{A} \cap \overline{B} \subseteq \overline{A \cup B}$.

Proof:

Def: The union of a collection of sets is

Similarly,

§2.3 Functions

Def: Let A, B be nonempty sets. A function f from A to B is

Ex:

Def: If $f: A \to B$, say A is domain of f, B is codomain. If $f(a) = b$, say

Def: The floor function $\lfloor \ \rfloor$ ass

the ceiling function $\lceil \ \rceil$

Def: If $f: A \to B$, and $S \subset A$, the image $f(S)$ of the set S is

$$f(S) = \{ \qquad \}$$

New functions from old :

Def: Let f_1, f_2 be functions from A to $\mathbb{R}$. Then $f_1 + f_2$ and $f_1 f_2$ are also functions from A to $\mathbb{R}$ defined by $(f_1 + f_2)(x) =$

$(f_1 f_2)(x) =$

Ex:

Def: A function f is one-to-one or injective iff

Ex:

Ex:

Def: A function $f: A \to B$ is onto or surjective iff