week of 9/25

2.1

A = {1,2} B = {a,b}
A x B = {(1,a), (1,b) }
(2, a), (2, b)

if A x B is empty
A x B = B x A
A x B = {}
A = {1,2} B = {}
A x B = {}

if A = B, then A x B → A x A

A subset of A x B is a relation from A to B. A relation to itself is called a relation on A

D is the domain The truth set of a statement P(x) is the set of elements x in D s.t. P(x) is true
{ $x \in D|P(x) = x \in D|P(x)$ is true }

2.2: Set Operations

Def: The union of the sets A and B, denoted $A \cup B$ contains the elements that are in A or B (or both) its the entire venn diagram (at least one section)
ex. A = {1,2,3} B = {2,3,4} $A \cup B$ = {1,2,3,4}

Def: The intersection of the sets A and B denoted $A \cap B$ = {x | x ∈ A and x ∈ B }

Two sets are called disjoint if their intersection is empty (is the empty set)
ex A = {1,2} B = {3,4}
A and B are disjoint

Inclusion - Exclusion
$|A \cup B| = |A| + |B| - |A \cap B|$

Def: the difference of sets A and B denoted by A - B, contains the elements that are in A, but not in B. A - B is also called the complement of B with respect to A.
(A - B same as A B)
$A - B = \{x|x \in A \wedge x \notin B\} = A - B = \{x|(x \in A) \wedge \neg(x \in B)\}$
ex.
A = {1,2,3} B={3,4,5}
A - B = {1,2} B - A = {4,5}

Def: the complement of the set A denoted $\overline{A}$, is the complement of A with respect to u. So $\overline{A}$ = u - a.
$\overline{A} = \{x|x \in$ u $\wedge$ }
$= \{x|x \notin A\}$
$A - B = \{x|x \in A \wedge x \notin B\}$

Fact: A - B = A $\cap$ $\overline{B}$
$A - B = \{x|x \in A \wedge x \notin B\}$

Power set
P(A) = { {}, {1}, {2}, {1,2} }
$|A| = 2$
$|P(A)| = 2^{|A|} = 2^2 = 4$
$|P(5)| = 2^{|5|}$

Rosen page 130 Table 1
compare to Rosen page 27 table 6

$\wedge \rightarrow \cap$ $\vee \rightarrow \cup$
T $\rightarrow$ u F $\rightarrow \emptyset$

ex. Show that A $\cap$ u = A Pf.
A $\cap$ u = $\{x|x \in A \wedge x \in u\}$
$= \{x|x \in A\}$
= A

ex. Show that $\overline{(\overline{A})} = A$
Pf:
$\overline{A} = \{x|\neg(x \in A)\}$
$\overline{(\overline{A})} = \{x|\neg(\neg(x \in A))\} = \{x|x \in A\} = A$