Discrete Math --- Day 12 --- September 22, 2004

Logic
What p $\wedge$ q $\vee$ r means?
Professor Hochberg said it's ambiguous, but the book says it's (p^q) v r.
Then convention that "and" precedes "or" in logical operations is not always assumed in the literature, where parenthesization is typically employed for clarity.

A taste of number theory!
For a, b $\in$ Z we say a is a multiple of b if a=mb for some m$\in$Z
Even numbers are the multiple of 2.
Is 12 even? 12=6*2 yes; Is 0 even? 0=0*2 yes

The Universal Set U
The compliment of set A is the set of objects "not in A"
$\bar{A}$= {x$\in$U|x$\in$A}
Note: U must be specified whenever you try to talk about compliments.
Ex. U=Z, A=even numbers, the compliment of A are the odd numbers

Membership Tables- Like truth table, use "1" for "T" and "0" for "F"; show whether a particular type of element is (1) or isn't (0) in set indicated by column heading

Examples:

A	B	AUB
1	1	1
1	0	1
0	1	1
0	0	0

A	B	A∩B
1	1	1
1	0	0
0	1	0
0	0	0

A	B	A⊕B
1	1	0
1	0	1
0	1	1
0	0	0

A	B	A-B
1	1	0
1	0	1
0	1	0
0	0	0

A	$\bar{A}$
1	0
0	1

Did you know intersection distributes over union? A∩(BUC)=(A∩B)U(A∩C)

A	B	C	BUC	A∩(BUC)	A∩B	A∩C	(A∩B)U(A∩C)
1	1	1	1	1	1	1	1
1	1	0	1	1	1	0	1
1	0	1	1	1	0	1	1
1	0	0	0	0	0	0	0
0	1	1	1	0	0	0	0
0	1	0	1	0	0	0	0
0	0	1	1	0	0	0	0
0	0	0	0	0	0	0	0

Notice both are equal on the table

Theoem: A∩B is a subset of AUB
Reference: x is a subset of y means every element of x is an element of y

A	B	A∩B		AUB
1	1	1	→	1
1	0	0		1
0	1	0		1
0	0	0		0

Notice for every "1" in A∩B there is a corresponding "1" in the AUB column. This proves that A∩B is a subset of AUB

AU$\bar{A}$= U

A	$\bar{A}$	A U $\bar{A}$	U
1	0	1	1
0	1	1	1

This is the law of excluded middle.

The universal set column is all "1" in their column and in the empty set is all "0".