Math 135

Note Title 9/24/2010

Announcements

- HW2 graded
- turn in HW3
- HW4 will be posted today, due in 1 week
- Exam review is in class next Friday
- First exam is the following Monday

Functions

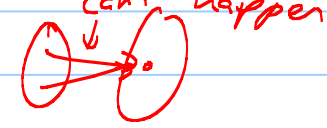
Recap: Functions map elements from one set to another.

Defns: domain:

codomain versus range:

onto: if every element in codomain is "hit"

1-1: if $f(a) = f(b)$, then $a = b$



bijection: if onto & 1-1

inverse

Last time:

Thm: Functions $f: A \to B$ and $g: B \to A$ are inverses of each other $\iff$ $f \circ g = i_B$ and $g \circ f = i_A$

proof: Two directions!

identity

(definitions are the key)

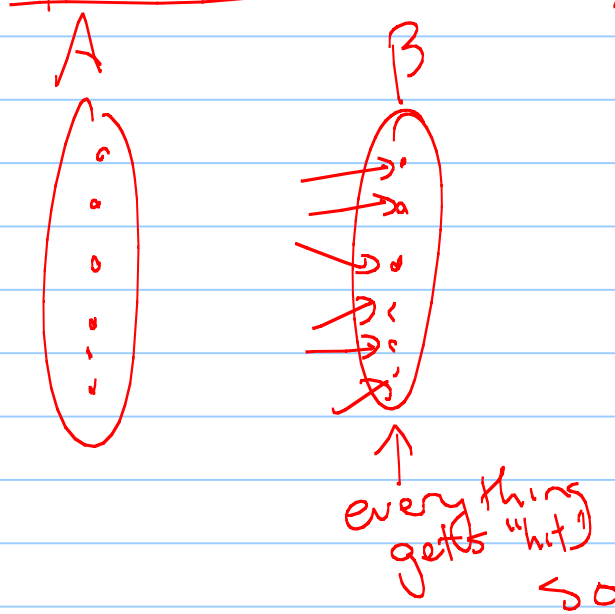
$|A|$ = size of A = n

Thm: Let A & B be finite sets, with $f: A \to B$.

a) If f is 1-1, then $|A| \leq |B|$.

b) If f is onto, then $|A| \geq |B|$.

proof of b:



proof by contradiction: Suppose f is onto

Suppose $|A| < |B|$.

Know every element of A gets mapped by f to exactly 1 element of B. (b/c f is a function).

So f can "hit" at most $|A|$ things.

Since $|A| < |B|$ that means something in B didn't get hit. ∎

Cor: If $f: A \to B$ is a bijection, then $|A| = |B|$.

Powerful Technique!

Ex: Poker - played with cards in 4 suites,

$\{\heartsuit, \clubsuit, \diamondsuit, \spadesuit\}$

and 5 cards in hand.

Show that some suite must appear twice.

(finished 2.3)