Proof of the Day:

Some students claimed to prove that

$2^k = 2^{k+1} - 1.$

Try to prove by induction that:

$2^k = 2^{k+1} - 1.$

Where does the proof go off-track?

Office hours:

Tuesdays: 12:30-1:30, 2:30-3:20.
If no dept. meeting 1:30-2:30 also works.
Wednesdays: 12:30-3:30.
Fridays: 12:30-2:30.

BUT: please let me know either by e-mail the day before or talking to me before the end of class what time you would like to come by so I don't have to hang around on days nobody wants to see me. Or you can send me e-mail or make an appointment for help.

Don’t forget to sign the attendance sheet every class you attend.

Do NOT sign the sheet if you do not plan on staying for the class.

Do NOT sign the sheet for anybody else.

Do NOT ask someone else to sign the sheet for you.

It will waste class time if I am forced to police the attendance sheet.

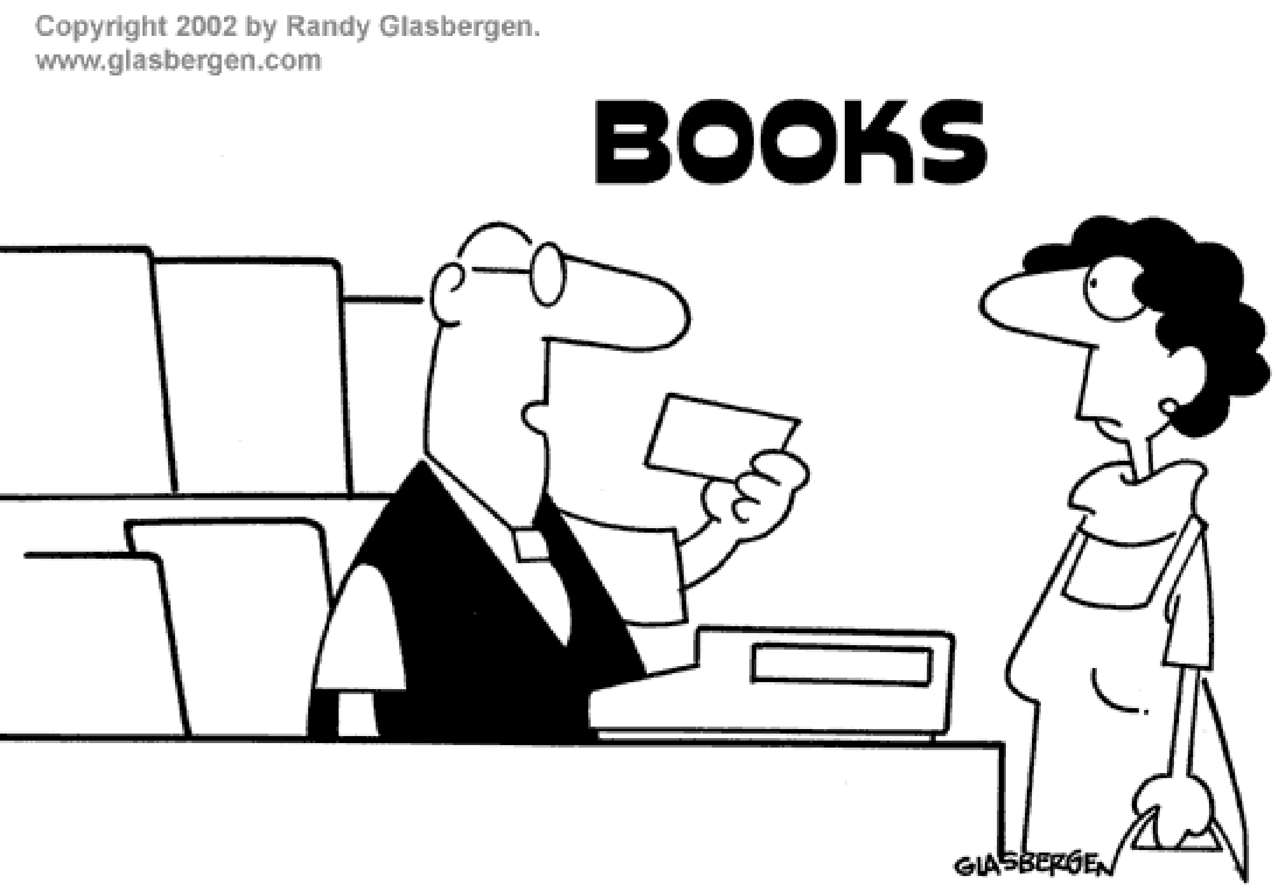
Induction:

I want you to:

1. Understand why it works as a proof technique.
2. Write proofs that explain clearly what you are doing at every step (except for very simple algebra). Be sure to mention where it is that you apply the induction hypothesis. Everything you write should be mathematically valid.
3. Be able to use it on novel applications (requires understanding).
4. If you try to prove a hypothesis that is not correct, I want you to indicate where and why the induction proof fails. You will get zero marks for "proofs" for incorrect statements.
5. Elegance is good (e.g. don't put more in the base case than you really need).

CSC 320:

To Infinity and Beyond



"Yes, we have *Chicken Soup for the Math Teacher's Soul.* The price is $\$475 \div 23 \times .018^2 - Y^3 + 4X \div \$73.99999 + 2.$"

Induction Review and Uncountable Sets

- Review of the standard template of an induction proof.
- Using diagonalization to prove a set is not countable.

Outline

- Definitions of equinumerous, cardinality, finite, infinite, countable, uncountable
- Tactics for proving that sets are countable
- Diagonalization for proving sets are uncountable

CSC 320 will challenge you to broaden how you think mathematically.

The idea that there is more than one “size” of infinity is a strange concept. Several new proof tactics are introduced.

On ongoing theme of this class will be that each of our language representation schemes represents a countable number of languages so some must be left out since the total number of possible languages is not countable.

Definitions:

Two sets A and B are equinumerous if there is a bijection (pairing) $f{:}A \to B$

A set S is finite (cardinality n) if it is equinumerous with {1, 2, …, n} for some integer n.

A set is infinite if it is not finite.

A set is countably infinite if it is equinumerous with the set of natural numbers.

A set is countable if it is finite or countably infinite.

Theorem 1:

The set $\{(p, q)$: p and q are natural numbers$\}$ is countable

Proof tactic: Dovetailing

Theorem 2:

The set $\{ r : r$ is a real number, $0 \leq r < 1 \}$

is not countable.

Proof tactic: Diagonalization

Note: Use diagonalization on the assignment when you want to prove a set is not countable. Do not use other results.