321 Section, Feb. 14

Natalie Linnell

Every restaurant serves a food that no one likes

Every restaurant that serves TOFU also serves a food which RANDY does not like.

There is some restaurant that serves some food that everyone likes

$$\exists r \forall p \exists f (\text{Serves}(r,f) \wedge \text{Likes}(p,f))$$

$$\forall r \exists p \forall f (\text{Serves}(r,f) \rightarrow \text{Likes}(p,f))$$

Prove that if n is even and m is odd, then (n+1)(m+1) is even

Prove by induction on the number of decimal digits in a that $a \equiv \text{digitsum}(a) \pmod 9$

Use strong induction to show that a rectangular 2nx2m checkerboard with two squares missing, one white and one black, can be covered with dominoes.

Multiply two matrices

Use structural induction to show that $a \leq 2b$ whenever (a,b) in S

- Basis: $(0,0)$ in S
- Recursion: If (a,b) in S, then $(a, b+1)$ in S, $(a+1, b+1)$ in S, $(a+2, b+1)$ in S

Use structural induction to show that for a full binary tree T, $n(T) \geq 2h(T)+1$

- $n(T) = n(T_1)+n(T_2)+1$
- $h(T) = \max(h(T_1), h(T_2)) + 1$

Give a recursive definition of the set of positive odd integers

Give a recursive definition of w^i, where w is a string, and i is a nonnegative integer

Give a recursive definition of

$S = \{(a,b) | a \text{ in } Z^+, b \text{ in } Z^+, \text{ and } a+b \text{ is even}\}$

Use structural recursion to prove that all elements of S have even sum.

Use structural induction to prove that l(wv) = l(w)+l(v)

- Definition of the set of strings
  - Basis: λ in Σ^* (empty string)
  - Recursion: w in Σ^*, then wx in Σ^*
- Definition of l(w)
  - Basis: l(λ) = 0
  - Recursion: l(wx) = l(w) +1