CSI 35 LECTURE NOTES (Ojakian)

Topic 7: Recursion

OUTLINE
(References: Wells sections 105-107, 124, 125)

1. Recursive Definitions

2. Related Inductive Proofs

1. <u>Recursive Definitions</u>

   (a) Define the function $F(n) = 2^n$ without using exponentiation, instead using recursion.

   (b) Program with recursion. And do iterative.
   (put in print statements to see operation)

   (c) Exercise 105.1.3 - b, d ((d) is a "Fibonnaci sequence")

   (d) Exercise 105.1.3 - c
   (Can you "solve" it in "closed form"?)

   (e) Define Factorial and program it.
   (put in print statements to see operation)

2. <u>Well-defined?</u>

   (a) Some examples of yes and no.

   (b) Collatz-like functions. Well-defined recursion?

      i. Half an even and double an odd.
      ii. Half an even and minus 1 from an odd.
      iii. The Serious Example: 106.1.2

3. <u>Finding a recurrence</u>

   (a) Do Exercise 124.2.3 (Find the recurrence and solve it)

   (b) Find a recurrence for $C(n, k)$.

   (c) From Wells, do exercise 125.6.9.

4. <u>Inductive Proofs about recursively defined functions</u>

   (a) Solve the recurrence from Exercise 124.2.3, and prove it using induction.

   (b) Prove C(n,k) formula (Thm 125.6) by induction

   (c) Do Wells exercise 107.3.12