CMSC330 Fall 2010 Quiz #3

Name ________________________________

Discussion Time (circle one):   9am   10am   11am   12pm   1pm   2pm

Instructions
• Do not start this test until you are told to do so!
• You have 15 minutes for this quiz.
• This is a closed book exam. No notes or other aids are allowed.
• Answer essay questions concisely in 2-3 sentences. Longer answers are not needed.
• For partial credit, show all of your work and clearly indicate your answers.
• Write neatly. Credit cannot be given for illegible answers.

1. (12 pts) OCaml
   a. (2 pts) Give the type of the following OCaml expression

   fun x y -> x (y+2)      Type =

   b. (2 pts) Write an OCaml expression with the following type

   (bool -> int) -> int      Code =

   c. (2 pts) Give the value of the following OCaml expression. If an error exists, describe the error.

   (fun x  -> if (x > 0) then x+1) 1      Value/Error =

   d. (6 pts) Using fold and an anonymous function, write a function attendance which when applied to a list lst of bools, returns the number of elements of lst that are true. Example: attendance [true; false; false; true; true] = 3

   let rec fold f a l = match l with
   [ ] -> a
   l (h::t) -> fold f (f a h) t
2. (8 pts) Context free grammars

   a. (2 pts) Write a grammar for $a^x b^y$, where $x = y + 3$ (i.e., exactly 3 more a’s than b’s)

   b. (6 pts) Consider the following grammar
      (where $S =$ start symbol and terminals = [ , ]; , e):

      $S \to [A] \mid \text{epsilon}$
      $A \to A \; ; \; S \mid e$

      i. (3 pts) Present a derivation for the string $[e;[e;]]$

      ii. (3 pts) Show the parse tree for your derivation