CMSC 330 (Spring 2017) Quiz 2

Name (as it appears on GradeScope): ______________________________________________________

Discussion Time (circle one): 10am 11am 12pm 1pm 2pm 3pm

Discussion TA (circle one): Aaron Alex Austin Ayman Daniel Eric Greg Jake JT Sam Tal Tim Vitung

Instructions:
- Do not start this quiz until you are told to do so.
- You have 15 minutes for this quiz.
- This is a closed book quiz. No notes or other aids are allowed.
- For partial credit, show all of your work and clearly indicate your answers.

1. (2 points each) Give the type of the following OCaml expressions.

   a. \((1.1, [5 < 2; false])\)

      float * bool list

   b. fun f a b -> f (b, a)

      (a * b -> c) -> b -> a -> c

   c. fun f -> (f 0.3) = 1

      (float -> int) -> bool

2. (2 points each) Give OCaml expressions with the following types \textit{without} using type annotations.

   a. (int * bool) list

      [[(1, true)]]

   b. (‘a -> ‘b) -> ‘a -> (‘a * ‘b)

      fun f a -> (a, f a)
let rec map f xs =  
    match xs with  
    | [] -> []  
    | x :: xs -> f x :: map f xs

let rec fold f v xs =  
    match xs with  
    | [] -> v  
    | x :: xs -> fold f (f v x) xs

3. (10 points) Write a function check_rows : bool list list -> bool that takes a list of lists of booleans xss as argument, and returns true iff every list xs in xss contains the value true. The inner and outer lists can have any length. You are encouraged but not required to use map and fold for this question. You are not allowed to use imperative features of OCaml. As always, you are allowed to define helper functions.

    check_rows [] = true  
    check_rows [[true];[]] = false  
    check_rows [[true];[false]] = false  
    check_rows [[true;false];[false;false;true]] = true

let check_rows xs =  
    let all xs = fold (fun a b -> a && b) true xs in  
    let any xs = fold (fun a b -> a || b) false xs in  
    all (map any xs)