CMSC 330, Fall 2018 — Quiz 1, OCaml

NAME _____

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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 your work and clearly indicate your answers.

1. [8 pts] Give the type of the following OCaml expression. If there is a type error, explain it.

   (a) `(1, [1 :: true])`

   (b) `(1 + 2.3) :: [2.2]`

   (c) `fun a b c -> if a = b then [c] else c :: [c]`

   (d) `fun x y z -> if x y > z then z else z + 1`

   Solution.

   (a) Error, `::` expects a list as its second argument.

   (b) Error, cannot `+` an `int` and a `float`.

   (c) `'a -> 'a -> 'b -> 'b list`

   (d) `('a -> int) -> 'a -> int -> int`

❑

2. [4 pts] Give an OCaml expression of the following type without using type annotations.

   (a) `(int -> bool) -> (int -> bool) -> bool`

   (b) `('a -> 'b) -> 'a -> 'b`

   Solution.

   (a) `fun a b -> (a 1) && (b 2)`

(b) `fun f a -> f a`

❑

3. [8 pts] Write a function `prime_squared` which applied to a list `lst` returns a list of tuples `(x, y)` where `x` is a prime in the list and `y` is the prime squared. The order of the primes in the returned list should be the same as in the argument.

   As a helper, you may assume a function `is_prime` exists which given an integer, returns `true` if the integer is prime and `false` otherwise. The type of `is_prime` is `int -> bool`. You may use `map` and either of the `fold` functions.

   For example, `prime_squared [1; 2; 3; 4; 5] = [(2, 4); (3, 9); (5, 25)]`.

   Solution.

```
let prime_squared (lst : int list) : ((int * int) list) =
  List.fold_right (fun ele acc ->
    if is_prime ele then
      (ele, (ele * ele)) :: acc
    else acc) lst []
```

❑