## CS 3304 Final Exam

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1. (20 points) Defining a function mystery of two arguments, in the SML environment, produces the following response:

```
val mystery = fn: int list -> int list -> int list
```

What can you say about mystery?

2. (20 points) Come up with an example of parameter passing (i.e., give code) where pass-by-value-result is distinguishable from pass-by-reference. Clearly explain how one of the mechanisms produces different results from the other.

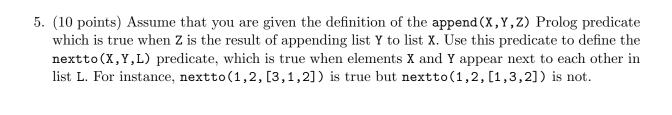
3. (10+10=20 points) Consider the following two Prolog segments:

```
/* segment 1 */
d(X) :- a(X), !, b(X).
d(X) :- c(X).

/* segment 2 */
d(X) :- a(X), b(X).
d(X) :- not(a(X)), c(X).
```

Assume that the definitions of a, b, and c are the same for both segments. Answer true or false for the following two statements (with reasons):

- All solutions for d (i.e., values for X) in segment 1 are also solutions for d in segment 2.
- All solutions for d in segment 2 are also solutions for d in segment 1.
- 4. (10 points) Consider a Smalltalk class Animal which has three instances fox, goat, and chicken. Assume also a subclass of Animal called Mammal. Let us suppose we wish to create an instance of Mammal called human. What message is required to do this and which object must be the recipient of this message? Present your answer in Smalltalk syntax.



6. (20 points) In any language of your choice, write a square function that returns the square of an integer. square *must* be written so that: (i) it is recursive, and (ii) the control context created upon its invocation must not need an ever-increasing amount of memory.