SI 413 Fall 2021: Homework 8

Due Friday, October 20

Your name:

Citations and collaborators:

Comments, suggestions, or questions for your instructor:

Fill out the first row of the table on a 0-5 scale before turning in.

This rubric is also available on the website under "Admin":

- **5**: Solution is completely correct, concisely presented, and neatly written.
- **4**: The solution is mostly correct, but one or two minor details were missed, or the presentation could be better.
- **3**: The main idea is correct, but there are some significant mistakes. The presentation is somewhat sloppy or confused.
- **2**: A complete effort was made, but the result is mostly incorrect.
- **1**: The beginning of an attempt was made, but the work is clearly incomplete.
- **0**: Not submitted.

Problem	1	2	Total
Self-assessment			
Final assessment			

1 Scope Tree

Consider the following program in a C-like syntax:

```
int x = 10;
int i = 5;

int foo(x) {
  if (x == i) {
    return 3;
  }
  else {
    int i = x - 1;
    int j = foo(i);
    return 3 * j;
  }
}

print foo(3);
```

Draw the scope tree for the program above. Then indicate what the final printed value would be using lexical scoping.

2 Frames and closures

Consider the following SPL code, which we will imagine is lexically scoped:

```
new counter := lambda start {
  new increment := lambda by {
    start := start + by;
    ret := start;
  };
  ret := increment;
};
new A := counter @ 0;
new B := counter @ 5;
write A@0;
write B@0;
write A@6;
```

Draw all the frames and links that result after executing this program. See the reading assigned from Unit 6 for exactly how these should be drawn, particularly Section 3.2.3 of SICP.

Specifically, every variable name that refers to a function should point to a closure, which is represented by a pair of circles, pointing to the referencing environment and the function definition, respectively. (You do NOT have to write out the complete body of every function.)

(Use the back of the page.)