CSSE304 Exam Final Paper Review

Instructions

Please complete the following problems. If you have questions, come up and ask. I will send out an answer key after the review session is over.

1. **Problem 1:** What are the basic steps and extra pieces of your interpreter? explain what each does.

2. **Problem 2:** What makes a function tail recursive or non-tail recursive?

3. **Problem 3:** What is the goal of converting your interpreter to continuation passing style?

4. **Problem 4:** How does call/cc work?

5. **Problem 5:** Walk through how this code runs. What does it output?

```
(* 2 (call/cc
    (lambda (k)
        (+ 5 4 (k (- 10 4)) 4))))
```

Imagine that we are in a lovely cafe in Paris. With us we have a genie who takes photographs of the things that are happening.

Here we are ordering our food. And in this one we are eating a delicious dessert. Now we are paying the bill.

Later, when we are remembering that wonderful night, we can ask the genie to rub a magic liquid on one of the photographs, and we will be back there in that cafe.
The waiter may be a bit older, we may be a lot heavier, but otherwise things are as they were before.

When we have finished our meal, we can spend the rest of the eveing wandering through the streets of Paris as we did before, or we can ask the genie to rub another photograph to take us somewhere else.

What if the Genie rubbed the wrong photograph and took us back to when we were paying the bill and leaving the restaurant? What a shame to have to pay for a meal that we never got to enjoy?

A Scheme interpreter is like a genie. It can remember where it is and go back there. It doesn't photograph everything, but only the things we tell it to photograph. It has a special "take a photograph" procedure named call-with-current-continuation. Applying call/cc produces a photograph (continuation) that we can rub (apply) whenever we want to escape to that point in the computation.