Exam 2, Computer science 356, Fall 2014

Time allowed: 75 minutes. Total points: 75.

Name: _____

Question 1. (5 points) The fictitious programming language Qava requires identifiers to begin with an uppercase letter, followed by any combination of uppercase letters, lowercase letters, and digits. For example, `Aj32h5`, `T` and `Pabc` are legal Qava identifiers, but `abc` and `56PQR` are not. Give a regular expression (using the regular expression notation from our lecture notes and/or JFLex) for Qava identifiers.

[A-Z][a-zA-Z0-9]*

Question 2. (5 points) Explain, in your own words, why it is sometimes necessary to specify the associativity of an operator when using a parser generator such as CUP.

To avoid ambiguity.

Eg: 5 - 4 - 3 needs to be left associative

Question 3. (5 points) In your opinion, what is the most significant difference between imperative languages and functional languages? Briefly justify your answer.

There are many important differences - as discussed in class. You can discuss any of those differences.

Question 5. (15 points) Convert the following Scheme function into an equivalent tail recursive Scheme function. Your function need only work correctly for nonnegative integer arguments.

```
(define (platypus x)
  (if (= x 0) -1
      (+ (* x 3) (platypus (- x 1)))))
```

```
(define (platypus-tr x accum)
  (if (= x 0) accum
      (platypus-tr (- x 1)
                   (+ accum (* x 3)))))

; invoke function with initial value of
; accum as -1
```

Question 7. (15 points) Draw a diagram, similar to the diagrams in the lecture notes, showing the memory layout of all pairs and pointers to pairs that results from the following Scheme definitions:

```
(define apple 5)
(define banana (list 6))
(define grape (list 7 8))
(define lemon (list 5 apple banana grape banana))
```