TENTH (AND LAST!) QUIZ

You have 15 minutes from the start of class to complete this quiz. Read the questions with care; work with deliberate speed. Don't give us more than we ask for. The usual instructions apply. Good luck!

Problem 1 (10 points)

Each of the functions below computes the average price of a list of restaurant structures (defined as usual).

```
(define RList-average-price1
  (lambda (RL)
    (local ((define total-price1
              (lambda (L n)
                (cond
                  ((empty? L) n)
                  (else (total-price1
                          (rest L)
                          (+ n (rrant-price (first L)))))))))
      (/ (total-price1 RL 0) (length RL)))))

(define RList-average-price2
  (lambda (RL)
    (local ((define total-price2
              (lambda (L)
                (cond
                  ((empty? L) 0)
                  (else (+ (rrant-price (first L))
                           (total-price2 (rest L))))))))
      (/ (total-price2 RL) (length RL)))))

(define RList-average-price3
  (lambda (RL)
    (local ((define total-price3 (foldr + 0 (map rrant-price RL))))
      (/ total-price3 (length RL)))))
```

As you answer the following questions, consider each version of `RList-average-price` (including its local definitions). You may just answer 1, 2, and/or 3 for each question.

(a) (2 points) Which of the three versions use explicit recursion?

(b) (2 points) Which of the three versions use an accumulator?

(c) (2 points) Which of the three versions will require linear space on the call stack?

(d) (2 points) Which of the three versions are tail-recursive?

(e) (2 points) Which of the three versions use functions as arguments?

Problem 2 (8 points)

(a) (1 point) The main goal of the "process control" or "job control" part of the operating system is to keep what component of the computer's architecture busy as much of the time as possible?

(b) (1 point) Virtual memory lets the programmer pretend to have more of what than actually exists? (Be more explicit than just "memory.")

(c) (2 points) Why is virtual memory useful?

(d) (4 points) List at least three different levels of the storage hierarchy, and indicate which end has (i) the greatest capacity, (ii) the fastest access time, and (iii) the greatest cost per bit.

Problem 3 (4 points)

(a) (1 point) What characteristic of data does data compression eliminate? (One word.)

(b) (2 points) A syntactic data compression algorithm works the same way no matter what its input is; a semantic data compression algorithm works on a specific kind of data and depends on specific characteristics of that kind of data.

(b.1) Which kind of compression, syntactic or semantic, is likelier to produce the smaller compressed result?

(b.2) Which kind of compression, syntactic or semantic, is likelier to be used in a widely used commercially available compression application?

(c) (1 point) Which is likelier to produce a smaller result on the same input, lossy or lossless data compression?