

SEVENTH 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 (6 points)

Complete the definition of this function, which uses restaurant structures as usual. Use one symbol per blank.

```
(define-struct rrant (name cuisine phone dish price))

;; update-rrant: rrant list-of-rrant -> list-of-rrant
;; If the rrant's name matches the name of a rrant on the list, substitute
;; all the rrant's information for the matching rrant on the list.
;; If not, return the list unchanged.
(define update-rrant
  (lambda (R LOR)
    (cond
      ((_____ LOR) _____)

      ((_____ (_____ R) (_____ (_____ LOR)))

        (_____ R (_____ LOR)))

      (else (_____ (_____ LOR) (_____ R (_____ LOR)))))))
```

Problem 2 (7 points)

Below is a definition of collection-change from the restaurant collection program:

```
;; collection-change: collection (rrant->boolean) (rrant->rrant) -> collection
;; Return a collection made up of all the restaurants in C, except that
;; those that pass test? are changed by action.
(define collection-change
  (lambda (C test? action)
    (map (lambda (rr) (cond ((test? rr) (action rr)) (else rr))) C)))
```

(a) (5 points) Complete the definition below by completing the two lambda expressions. More than one item may be necessary for each blank, but the answers aren't long.

```
;; update-rrant: rrant list-of-rrant -> list-of-rrant
;; If the rrant's name matches the name of a rrant on the list, substitute
;; all the rrant's information for the matching rrant on the list.
;; If not, return the list unchanged.
(define update-rrant
  (lambda (R LOR)
    (collection-change LOR
      (lambda (X) _____)

      (lambda (Y) _____)
```

(b) (2 points) The behavior of these two versions of update-rrant, if they're completed correctly, is almost identical. In what way do they behave differently? (Hint: Think about how much work each version does for various kinds of inputs.)

Problem 3 (9 points)

A Deus X reference sheet is attached. You may tear it off; you don't have to turn it back in.

We'll have a better chance of assigning you partial credit if you show your work (e.g., draw a picture of the register(s) and/or memory locations).

(a) (3 points) Suppose that location 222 of the Deus X machine's memory holds the number 20 and that location 333 holds the number 30. What is in location 333 after executing these three instructions? (The first number on each line indicates the instruction's address in memory.)

```
0.  10  222    (lda 222)
1.   3  333    (mult 333)
2.  21  333    (stb 333)
```

(b) (4 points) Suppose that location 444 of the Deus X machine's memory holds the word `FISH`, that location 555 also holds the word `FISH`, and that location 666 holds the word `DISH`. What does the deus X machine print after executing these instructions?

```
0.  10  444    (lda 444)
1.  50  666    (cmpa 666)
2.  60    5    (je 5)
3.   6  666    (out 666)
4.   7    6    (jmp 6)
5.   6  555    (out 555)
6.   ...
```

(c) (2 points) Which of the following operations would you expect to see as a single machine-language instruction on a typical computer (like the Deus X)? (Choose *one or more* of the following.)

- A. Add two numbers together.
- B. Add a list of ten numbers.
- C. Compare two numbers to see whether one is greater than the other.
- D. Launch an application when the user clicks an icon.
- E. If a pixel has a red value below some limit, increase its red value.