THIRD QUIZ

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

Problem 1 (2 points)

Evaluate each of the following expressions. (That is, what does DrScheme display in the interactions window when you enter the expression(s) in the definitions window and click Run?) Recall that even? and odd? are predefined predicates that tell whether a number is even or odd, respectively.

(a) (>= (+ LAB1 LAB2) 50)

(b) (and (even? LAB1) (even? LAB2))

(c) (string-append "Good "
    (cond
     ((even? (/ 50 2)) "Morning")
     (else "Day")))

Problem 2 (4 points)

Evaluate each of the following expressions. Use this definition independently for each of the five parts:

(define L (cons "David" (cons "Joel" (cons "Wiwat" (cons "Jordan" (cons "Grace" empty)))))))

(a) (first L)

(b) (first (rest L))

(c) (rest L)

(d) (first (rest (rest L)))

(e) (cons "Tutors:" (rest (rest (rest L))))

Problem 3 (12 points)

We run the Anteater Fruit Farm and sell our produce at local farmers’ markets. Our sales management software defines a fruit structure as follows to hold each kind of fruit we grow:

(define-struct fruit (name howmany price organic?))

where name is a string representing a kind of fruit, howmany is the number of pieces we brought to the market, price is the number of dollars we charge per pound, and organic? is a boolean that’s true if this fruit was organically grown and false otherwise.
(define-struct fruit (name howmany price organic?))

(a) (2 points) We have harvested 450 organic apples for this week’s market and we plan to sell them for $2.50 a pound. Write a Scheme expression to create a fruit structure that represents this.

(make-fruit "Apples" 450 2.50 true)

(b) (2 points) Define the function sale-price as described below.

;; sale-price:  fruit number -> number
;; The input is the number of pounds of this fruit a customer has bought.
;; Return the amount the customer must pay for this purchase.
(define sale-price
  (lambda (F weight)
    (* (fruit-price F) weight)))

(c) (3 points) Define the function fruit-update-inventory as described below.

;; fruit-update-inventory: fruit number -> fruit
;; Someone buys the specified number of pieces of this fruit. Return the fruit
;; structure updated to reflect the decreased number you now have to sell.
(define fruit-update-inventory
  (lambda (F numsold)
    (make-fruit (fruit-name F) (- (fruit-howmany F) numsold) (fruit-price F) (fruit-organic? F))))

(d) (5 points) Our farmer’s market adds a 10% surcharge on the price of every sale of non-organic produce; organic produce has no surcharge. Define the function sale-surcharge as described below. Where applicable, use functions you have already defined rather than duplicating code.

(define SURCHARGE-RATE 0.10)
(define sale-surcharge
  (lambda (F weight)
    (cond ((fruit-organic? F) 0)
          (else (* SURCHARGE-RATE (sale-price F weight))))))

Problem 4 (2 points)

In class we discussed circuit-switched networks and packet-switched networks.

(a) A transmission typically gets split up into pieces that may take different routes to the destination. Does this describe circuit-switching or packet-switching?

(b) One describes message routing on the internet; the other describes conventional telephone service. Which is which?