UNIVERSITY OF TORONTO
Faculty of Arts and Science

TERM TEST #2
CSC 104H
Duration — 50 minutes

Last/Family Name: ____________________________________________
First/Given Name: ____________________________________________
utorid: ______________________________________________________

Do not turn this page until you have received the signal to start.
(In the meantime, please fill out the identification section above.)

This test consists of 4 questions on 6 pages (including this one).
When you receive the signal to start, please make sure that your copy
of the test is complete.

Good Luck!
; Question 1 [8 Marks]

; Part A [4 Marks]
; Assume this variable L0 has been defined.
(define L0 (list 1 (list 2 3) 4 (list 5) 6 7 (list 8 9 10)))

; For each of the following expressions, show the final result value:
(length L0)

(reverse L0)

(filter list? L0)

(filter number? L0)

; Part B [4 Marks]
; Assume this variable L1 has been defined.
(define L1 (list (list "apple" "peach") (list "kiwi") (list "grape" "pear")))

; For each of the following expressions, show the INTERMEDIATE STEP(S) and final result value:
(map reverse L1)

(map length L1)

(apply append (map rest (reverse L1)))
Question 2 [8 Marks]
Assume this function g has been defined.
(define (g s)
  (cond [(equal? s "") #false]
        [(string-contains? (substring s 0 1) "aeiou") #true]
        [else (g (substring s 1 (string-length s)))]))

; Remember the behaviour of substring:
(check-expect (substring "abcde" 0 2) "ab")

Part A [4 Marks]
For each of the following expressions, show the final result value.
You may also include any intermediate steps that you find helpful.
(g "")

(g "a")

Part B [4 Marks]
For the following expressions, show at least TWO intermediate steps, and the final result.
(g "cat")

(g "skyr")
; Question 3 [12 Marks]

; Part A [4 Marks]
; Based on the check-expects below, define the function sprout.

; Documentation/Testing.
(check-expect (sprout (triangle 12 "outline" "black")) △○△)
(check-expect (sprout (rectangle 10 25 "outline" "black")))

; Partial Design.
(check-expect (sprout (rectangle 10 25 "outline" "black"))
  (beside (rectangle 10 25 "outline" "black")
    (circle 25 "outline" "black")
    (rectangle 10 25 "outline" "black")))

; Define sprout here, including its type contract.
; Reminder: image-width and image-height produce the width and height of an image.

; Part B [3 Marks]
; Complete the two incomplete design check-expects on the next page.
; Do not draw any images by hand.
; Use sprout to help.
; Inside the check-expect for (beads 1) use the expression (beads 0).
; Inside the check-expect for (beads 2) use the expression (beads 1).

; Documentation/Testing.
(check-expect (beads 0) ○)
(check-expect (beads 1) ○○)
(check-expect (beads 2) ○○○)

; Design for 0:
(check-expect (beads 0) (circle 5 "outline" "black"))
; Design for 1:
(check-expect (beads 1))

; Design for 2:
(check-expect (beads 2))

; Part C [5 marks]
; Define the function beads.
; Question 4 [4 Marks]

; Assume this function f has been defined.
(define (f a)
  (local [(define (h b)
            (+ a b))]
         (map h (list 1 0 4)))))

; For the following expression, show at least TWO intermediate steps, and final result value.
(f 50)