PLEASE HAND IN

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UNIVERSITY OF TORONTO
FACULTY OF ARTS AND SCIENCE

TERM TEST #1

CSC 104H
DURATION — 50 MINUTES

LAST/FAMILY NAME: _____

FIRST/GIVEN NAME: _____

Do NOT *turn this page until you have received the signal to start.*
(In the meantime, please fill out the identification section above, and read the instructions below.)

This test consists of 5 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.
Please answer questions in the space provided.
You will earn 20% for any question you leave blank or write "I cannot answer this question," on.

Good Luck!

QUESTION 1. [6 MARKS]

Consider the following predicate:

```
(define (p a b c)
  (not (and (or a b) c)))
```

For each of the following expressions, show the INTERMEDIATE STEPS and FINAL RESULT VALUE:

```
(p true false true)
```

```
(p true true true)
```

```
(p false false true)
```

```
(p false false true)
```

QUESTION 2. [10 MARKS]

Assume the expressions below have been typed into the Definitions pane of DrRacket.
Below each one [except `(require picturing-programs)`], show the INTERMEDIATE STEPS AND RESULT VALUE that the expression produces when the "Run" button is clicked.
The colour of any images you draw is unimportant: use whatever colour pen or pencil you have.

```
(require picturing-programs)
```

```
(flip-vertical (above (triangle 10 "solid" "black") (triangle 20 "outline" "black")))
```

```
(length (list 123 true (string-append "a" "b" "c") (circle 10 "solid" "black")))
```

```
(apply above (map flip-vertical (list (triangle 10 "solid" "black")
                                      (triangle 20 "outline" "black"))))
```

```
(first (reverse (list "hello" (string-append "and" "bye"))))
```

QUESTION 3. [10 MARKS]

Complete the functions `speed` and `fits-inside?` by:

(i) Writing another `check-expect` expression.

(ii) Filling in the contract: the datatype of each input, followed by an arrow "->", followed by the datatype of the output. We already put in a comment line for the contract, with the "->", so you just need to write down the datatypes in the space provided.

(iii) Writing the body of the function.

PART (A) [5 MARKS]

```
; speed :                                                  ->
;
; Produce the speed of going from a start point to an end point in a given time:
;  the difference between the end and the start, divided by the time.
(define (speed start end time) ; Write the body of the function below here.




  )
; For example the speed from 40 to 100 in time 3 is 60 divided by 3.
(check-expect (speed 40 100 3) 20)
; Write another check-expect for speed :
```

PART (B) [5 MARKS]

```
; fits-inside? :                                           ->
;
; Does image-1 fit inside image-2 ?
(define (fits-inside? image-1 image-2)  ; Write the body of the function below here.




)

(check-expect (fits-inside? ♡  •)
              (and (< (image-width ♡) (image-width •)))
                   (< (image-height ♡) (image-height •)))
; Write another check-expect for fits-inside? :
```

QUESTION 4. [11 MARKS]

Assume these two expressions have been typed into the Definitions pane of DrRacket:

```
(require picturing-programs)
(define fish  ) ; USE fish, DON'T DRAW IMAGES BY HAND.
```

The following leads you to writing a new function yin-yang.

PART (A) [2 MARKS] Write an expression that produces  :

PART (B) [2 MARKS] Write an expression that produces  :

PART (C) [2 MARKS] Write an expression that produces  :

PART (D) [2 MARKS] Complete the SECOND check-expect for function yin-yang:

```
(check-expect (yin-yang  )  )
(check-expect (yin-yang  )
```

)

PART (E) [3 MARKS] Write the contract, header and body to define the yin-yang function:

```
; yin-yang:
(define
```

)

QUESTION 5. [6 MARKS]

Consider the following function definitions:

```
(define (f n) (- n 7))

(define (g a-list) (= 0 (apply * (map f a-list))))
```

PART (A) [2 MARKS]

For the following expression, show the INTERMEDIATE STEPS and FINAL RESULT VALUE:

```
(map f (list 9 8 10))
```

PART (B) [2 MARKS]

For the following expression, show the INTERMEDIATE STEPS and FINAL RESULT VALUE.
You may assume your result from above while showing the steps.

```
(g (list 9 8 10))
```

PART (C) [1 MARK]

Show an example of a list so that the result of using g on it produces `true`:

PART (D) [1 MARK]

Give a simple description of WHAT g accomplishes (NOT HOW g accomplishes it):

1: _____/ 6

2: _____/10

3: _____/10

4: _____/11

5: _____/ 6

TOTAL: _____/43