

Assignment 1

This assignment is worth 10 marks. Deadline March 2nd EOD.

1.

$$f(n) = \begin{cases} n, & \text{if } n < 3 \\ f(n-1) + 2f(n-2) + 3f(n-3) & \text{if } n \geq 3. \end{cases}$$

Provide two versions of f

Write a procedure $f\text{-rec}$ that computes by means of a recursive process.

Write a procedure $f\text{-iter}$ that computes by means of an iterative process.

4 marks

2. Write a procedure (qck-split $func$ pivot my-list). The procedure $func$ performs a boolean test. The procedure $func$ takes two operands and if ($func$ y pivot) returns true, then the output of qck-split should contain y , where $y \in my\text{-list}$.

For example

(qck-split < 5 (list 3 1 5 8 4 2 9 2)) should return, (3 1 4 2 2)

(qck-split ≤ 5 (list 3 1 5 8 4 2 9 2)) should return, (3 1 5 4 2 2)

Use this procedure to write a procedure (qck-srt my-list) that sorts my-list using quicksort algorithm.

my-list consists of numbers which may have multiple instances.

Optimizing quicksort (say using randomization) is not required.

2 marks

3. Write a procedure which mimics a do-while loop in java. The procedure ($do\text{-while}$ $proc$ start limit $my\text{-inc}$) should take four arguments. The $proc$ is a procedure which should print the value of start on a newline. Everytime $proc$ is executed, the start should be incremented by a procedure called $my\text{-inc}$. start and limit are assumed to be positive integers. As long as the value of start is less than or equal to limit, it should execute the body of the do-while procedure. Keep in mind that the do-while construct is expected to execute the procedure at least once, before it test the condition for termination.

2 marks

4. Write a procedure (rep-op $func$ x) that takes as input a procedure $func$ on a single variable and a positive integer x . The output is a procedure which is procedure $func$ applied x times to itself.

For example (rep-op square 3) should return a procedure which applies square procedure three times. So ((rep-op square 3) 5) should return $((5^2)^2)^2$.

(rep-op inc 5) should return a procedure that increments by one five times. So ((rep-op inc 5) 4) should return 9.

2 marks

General Guidelines for the course evaluation

Even for someone with no experience of coding in scheme, this assignment can be completed in 1-2 hrs. You do not need to code for inputs which do not have the expected format. You may assume that the input is in a valid form.

Please refrain from asking for deadline extensions and do not email me the submission. Please ensure that the submission is the correct version of the solutions you have devised. Please be aware that the lms server might occasionally have some traffic issues and therefore you are advised to upload at least one hr before the deadline.

The total weight of the assignments is roughly 35-40 marks.

Mid-Sem and End-sem would carry another 60 marks. I may also conduct a 5- to 10-point MCQ quiz. The MCQ quiz will not be a surprise quiz. If the MCQ quiz is conducted, then the weightage of the theory exams would be reduced proportionately. You will be given around a week's time to prepare for it if an MCQ quiz is planned.

If the attendance gradually starts to decrease, I may consider conducting surprise tests.

The names of the procedures should not be changed. All the solutions should be provided in a single .rkt file. Name of the file should be *EntireRollNo_AssignmentNo.rkt*

For example, if B20043 is submitting his solution for 3rd assignment, then the file name will be B20043_3.rkt