CSE 461: Programming Languages Concepts

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Spring 2022

Homework 4: Racket warming up
Due on Mar 6th at 6pm in Canvas.

Submission: you should submit via Canvas a DrRacket file with Racket code in. Please clearly mark your answers using comments so that we can tell the correspondence between your code and questions.

1. (0 points) Go through a brief tutorial about the DrRacket programming environment at `http://docs.racket-lang.org/drracket/index.html`.

2. (3 points) $sum(start, end)$ computes the sum from start to end; e.g., $sum(3, 6)$ computes 3+4+5+6, which is 18. It can be defined recursively in the following way. Define the corresponding Racket function, following the definition below.

$$sum(start, end) = \begin{cases} start & \text{if } start = end \\ sum(start, end - 1) + end & otherwise \end{cases}$$

3. (3 points) Write the Hofstadter functions in Racket. Hofstadter Female and Male functions are a pair of mutually recursive functions defined as follows:

$$F(0) = 1$$
$$M(0) = 0$$
$$F(n) = n - M(F(n-1)), \text{when } n > 0$$
$$M(n) = n - F(M(n-1)), \text{when } n > 0$$

4. (3 points) A cash reward credit card rewards back to a customer a portion of the charges the customer makes over a month. One such credit card rewards back

   (a) 1% for the first \$2000 of charges,

   (b) 1.5% for the next \$2000 (that is, the portion between \$2000 and \$4000),

(c) 2% for the next \$1500 (that is, the portion between \$4000 and \$5500),

(d) and 2.5% for everything above \$5500.

Define the function `reward`, which consumes a charge amount and computes the corresponding reward amount.