CS302: Paradigms of Programming

Lab 1: Functional Programming with Numbers

February 23^{rd}, 2021

Q1. Compute the value of the following expression using Scheme:

$$\frac{5+4+(2-(3-(6+\frac{4}{5})))}{3(6-2)(2-7)}$$

Q2. Define a function `leastTwo` that returns the sum of the smallest two of its three inputs. For instance:

```
(leastTwo 3 1 2) = 3
(leastTwo 8 8 3) = 11
```

Q3. Given two integers x and n and an integer exponent y, write a function `(modexp x y n)` that will output $x^y \ mod \ n$.

Q4. Recall whom did we agree to have invented perhaps the largest number of things named after him. Apart from the square-root method (using `good-enough`, `improve`, and an initial `guess`), he had also invented a method to compute cube-roots. The method is based on the fact that if y is an approximation to the cube root of x, then a better approximation is given by:

$$\frac{x/y^2+2y}{3}$$

Use this formula to implement a cube-root function analogous to the square-root one.

Q5. Determine and explain the answer to Exercise 1.5 from SICP to the TA.