CS 2500, Spring 2012
Problem Set 1

Due date: January 18, 2012

Problem 1. A typical exercise in an algebra book asks the reader to evaluate an expression like

$$\frac{n}{3} + 2$$

for $n = 2$, $n = 5$, and $n = 9$. Using Racket, we can formulate such an expression as a program and use the program as many times as necessary. Here is the program that corresponds to the above expression:

```
(define (f n)
  (+ (/ n 3) 2))
```

First, determine the result of the expression at $n = 2$, $n = 5$, and $n = 9$ by hand, then with DrRacket's stepper.

Also formulate the following three expressions as programs:

a) $n^2 + 10$
b) $(1/2) \cdot n^2 + 20$
c) $2 - (1/n)$

Determine their results for $n = 2$ and $n = 9$ by hand and with DrRacket.

Problem 2. The local supermarket needs a program that can compute the value of a bag of coins. Define the program sum-coins. It consumes four numbers: the number of pennies, nickels, dimes, and quarters in the bag; it produces the amount of money in the bag.

Problem 3. An old-style movie theater has a simple profit function. Each customer pays $5 per ticket. Every performance costs the theater $20, plus $.50 per attendee. Develop the function total-profit. It consumes the number of attendees (of a show) and produces how much income the attendees produce.

Problem 4. Develop the function, *total-inches*. The function consumes a length represented by two numbers: the first a number of feet, and the second a number of inches. The function produces the total length in inches.

Problem 5. Develop a function that when given an initial amount of money (called the principal), a simple annual interest rate, and a number of years will compute the balance at the end of that time. Assume that no additional deposits or withdrawals are made. Total interest is the product of the principal, the annual interest rate expressed as a decimal, and the number of years.