Fun Set # 1

September 26, 2014

Problems increase in difficulty as you go down each section. Those marked with asterisks are challenge problems that might require a bit more effort. Remember though that there is only one instruction for this set: have fun :D

1 Fun with Function definitions

1. In addition to incrementing a number by one, there are many cases when we want to decrease a number by 1, i.e. we want to decrement a value. Write a function that decrements a number
2. Write a function that multiplies the number passed to it by 2
3. Write a function that returns the value passed into it
4. *Strings in Racket are a bunch of characters between double quotes. For example "Racket" is a string in Racket. We can do a lot of things with strings in Racket. One common operation is to join strings. We call the operation of joining strings concatenation. We do this with the str function in Racket. For example, (string-append "Hello" " " "World") returns "Hello World". Write a function that says hello to the person whose name is passed in as a Racket string. For example, (say-hello "Jane") should return "Hello Jane".
5. *In video game programming and physics modelling, given the initial velocity (u) of an object, its acceleration (a), and its time elapsed since it began to move (t), we want to calculate the:

   (a) The distance traveled(s) using the formula $s = ut + \frac{1}{2}at^2$

   (b) Its current velocity (v) using the formula $v = u + at$

   Write functions that given u, t, and a can compute the above

2 Fun with Higher Order functions

1. Remember our apply-fun-twice function from today? Write a function that takes two functions and applies them in the order specified to some some

argument. For example, (apply-two-functions increment sqr 2) should return 5. Explanation: $2^2 = 4$ and $4 + 1 = 5$ NB: the increment function adds one to the number passed into it.

2. *The equation of a straight line is $y = mx + c$. Write a function that given the values of m and c, returns a function that calculates the y-value of different x-values.

3. *Quadratic equations are of the form $y = ax^2 + bx + c$. Suppose that we want to have a bunch of functions representing different quadratic equations. Write a function that accepts a, b, and c and returns a function that computes the answer for the corresponding quadratic. For example (quadratic 2 3 4) should return a function that computes $2x^2 + 3x + 4$ for different values of x.