MA 151: Homework #3

due Tuesday September 22

Written problems
In each of these, simplify the expressions step-by-step to get the final value. If there is an error, say exactly what the problem is. If the function gives an infinite loop, explain in general terms what the output will be. You should show enough detail to make it clear that you know what is going on. In all cases, you should be able to check your answer by typing the expressions into GHCi.

1. snd (head (fst ("hello", 15)))
2. snd (fst [(1,2),(4,6)])
3. sum [4 * x | x <- [1..5]]
4. maximum [3 * length x | x <- ["fake", "it", "to", "make", "it"] ]
5. product [ x | x <- [1..20], mod x 4 == 0]

Programming problems
Include a type signature for all functions you define. Make the type signatures polymorphic whenever possible.

- Define a function called `collapser` which takes a list of Ints as its only parameter. The output should be 0 if the list is empty, the sum of the list entries if the list begins with 0, and the product of the list entries otherwise. (Use an if inside an if to choose between 3 alternatives.)

- Define a function called `notDivBy` which takes one Int parameter n and returns the infinite list of all positive numbers not divisible by n.

- Define a function called `listOfLengths` which takes a list of lists and returns a list of their lengths. For example:
  \[ \text{listOfLengths } [[1,4,5],[2,3],[],[1..10]] ] \text{ is } [3,2,0,10] \]

- Define a function called `listInBed` which takes a list of strings and adds " in bed!" to each one. For example: `listInBed ["hi", "everybody"] is ["hi in bed!", "everybody in bed!"]`

- Define a function called `isASquare` which takes an integer n and returns a Bool which says whether or not n is the square of another integer. (Hint: make the list of squares, then use `elem` to test whether or not n is in this list.) Don't try to use the built-in `sqrt`.

- Define a function called `twins` which takes a list of pairs and returns only the ones that are “twins”. So:
  \[ \text{twins } [(3,1), (1,1), (2,9), (4,4), (9,0)] ] \text{ is } [(1,1), (4,4)] \]