Math 6833 assignments

28. Write functions that do the following.

1. **shuffle :: [a] -> [a] -> [a]**, that has the effect
   
   \[
   \text{shuffle } [x_1,x_2,x_3,x_4] \ [y_1,y_2,y_3,y_4] = [x_1,y_1,x_2,y_2,\ldots]
   \]
   
   Write a version **robustShuffle** that just drops extra terms, but write **shuffle** to allow either the lengths to be equal or the first string to have an extra term, as in
   
   \[
   \text{shuffle } [x_1,x_2,x_3] \ [y_1,y_2] = [x_1,y_1,x_2,y_2,\ldots]
   \]
   
   but to give an error message otherwise. Use **robustShuffle** in the definition of **shuffle**, if you wish.

2. **oddTerms :: [a] -> [a]** returns a list of the first term, third term, fifth term, etc. **oddTerms** \([2,4,6,8,10]\) = \([2,6,10]\). Similarly for **evenTerms**.

29. Determine what the following function does:

   \[
   \text{mystery list1 list2 = concat ( \_ zipWith \_ x y -> [x,y] ) list1 list2 }
   \]

30. The Prelude function **takeWhile** is defined by:

   \[
   \text{takeWhile p [] = []}
   \]
   \[
   \text{takeWhile p (x:xs)}
   \]
   
   | p x = x : takeWhile p xs
   | otherwise = [ ]

   1. Determine the type of **takeWhile**

   2. Use **takeWhile** to define functions **takeWord** and **removeWord** that take or remove the initial non-blank characters of a string, for example

      \[
      \text{takeWord "first test string" = "first"}
      \]
      \[
      \text{takeWord " test string" = " test string"
      }
      \]
      \[
      \text{removeWord " first test string" = " test string"
      }
      \]
      \[
      \text{removeWord "first test string" = " test string"
      }
      \]

   Define corresponding functions **takeBlanks** and **removeBlanks**.

   3. Using these auxiliary functions to define the following functions:

      (a) A function to split a string into its words:

      \[
      \text{splitString "A list of characters." = ["A","list","of","characters."]}
      \]

      (b) A function to split a string into pairs consisting of its words and the number of blanks that follow them:

      \[
      \text{splitStringWithBlanks "A list of characters. End." =}
      \]
      \[
      [("A",1),("list",1),("of",1),("characters.",2),("End.",0)]
      \]
      \[
      \text{splitStringWithBlanks " Another." = ["",2),("Another.",0)]}
      \]

   4. Define the inverse of **splitStringWithBlanks**.