Assignment 2
Advanced Functional Programming
Topics: Generator/Selector-Principle
Issued on: 03/19/2008, due date: 04/28/2008

For this assignment a Haskell script named `AssFFP2.hs` shall be written offering functions which solve the problems described below. This file `AssFFP2.hs` shall be stored in your home directory, as usual on the top most level. Comment your programs meaningfully. Use constants and auxiliary functions, where appropriate.

- The value of the exponential function exp at point x is approximated by the series

  $$exp\ x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + ...$$

  Implement a Haskell function `exps :: Float -> [Float]`, which yields the stream of of k-prefixes approximating the value of exp at x. This means, the output of `exps` shall be the stream `[1,1 +` $\frac{x}{1!}$`,1 +` $\frac{x}{1!}$ `+` $\frac{x^2}{2!}$`,...`

- Implement a Haskell function `expskPref :: Int -> Float -> Float`, which, if applied to k, $k \in \mathbb{N}$, and x yields the k-prefix of `exp x`. This means, if $k = 1$, `expskPrefthen` yields the value 1. If $k = 3$, it yields the value of the expression $1 + \frac{x}{1!} + \frac{x^2}{2!}$.

- Let $m, n, p \in \mathbb{N}$. The triple (m, n, p) is called a *Pythagorean triple*, if $m \leq n \leq p$ and $m^2 + n^2 = p^2$. Write a Haskell function `pythTriples :: [(Integer,Integer,Integer)]`, which yields the stream of all Pythagorean triples, which shall be ordered in the following fashion: The components of each triple are in ascending order; a triple t_1 occurs earlier in the stream than a triple $t2$, if the third component of t_1 is smaller than that of $t2$, i.e. `pythTriples` equals the stream `[(3,4,5),(6,8,10),(5,12,13),(9,12,15),...`

- Implement a function `primePytTrp :: Int -> [(Integer,Integer,Integer)]`, which, depending on the value of its argument n yields a substream of the set of Pythagorean triples. If $1 \leq n \leq 3$, it yields the substream of triples, where n or more components of the triple are prime. Otherwise, it yields the empty list.