Assignment 1
Advanced Functional Programming
Topics: Generator/Selector-Principle
Issued on: 03/21/2010, due date: 04/13/2010

For this assignment a Haskell script named `AssFFP1.hs` shall be written offering functions which solve the problems described below. This file `AssFFP1.hs` shall be stored in the home directory of your individual account (not of your group account), 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 $m, n, p \in \mathbb{N}$ and $m, n, p > 0$. 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.