Chapter 4 Homework, from Lecture and Textbook

12/4/2010

1 Assigned in Lecture 4

- Read Phil Wadler's Paper "Theorems for Free!" - www.mpi-sws.org/ dreyer/tor/papers/wadler.pdf
  Done, hardly understood a thing. I am going to need to return to this paper after studying some lambda calculus, etc etc.
- Define safetail, so that it acts just like tail except that it maps the empty list to the empty list rather than being undefined for that input. Hint the function null can be used to test if a list is empty. Define using each of the following:
  - A Conditional Expression

```
mytail (x:xs) = xs
csafetail xs = if xs == [] then [] else mytail xs
```

  - Guarded Equations

```
gsafetail xs | xs == [] = []
             | otherwise =  tail xs
```

  - Pattern Matching

```
psafetail [] = []
psafetail (x:xs) = xs
```

- Give three possible definitions for the logical (||) or operator using pattern matching.

```
(||1) :: Bool → Bool → Bool
True ||1 True = True
True ||1 False = True
False ||1 True = True
False ||1 False = False

(||2) :: Bool → Bool → Bool
x ||2 x = x
x ||2 y = if x then True else y

(||3) :: Bool → Bool → Bool
True ||3 _ = True
False ||3 x = x
```

- Redefine the following version of && using conditionals rather than pattern matching

```
True && True = True
_ && _ = False

(&&cond) x y = if x == y
                  then if x == True
                          then True
                          else False
                  else False
```

- Do the same for the following version:

```
True && b = b
False && _ = False

(&&cond2) x y = if x == True
                   then y
                   else False
```