**Assignment 4 - Theoretical questions**

**Question 1b**

Let’s define the equivalence of high-order function g and its CPS version g$ as follows: For any CPS-equivalent parameters f1…fn and f1$...fn$ **(g$ f1$...fn$ cont) is CPS-equivalent to (cont (g f1…fn))**. Now we are going to show that pipe$ is equivalent to pipe, by induction on the size of the list.

Base: N=1 (cont (pipe(f1$))) = (cont f1$) (pipe$ f1$ cont) = (cont (lambda (x cont2) (f1$ x cont2))) = (cont f1$)

Induction step: Assuming (pipe$ f1$ … fn$ cont) = (cont (pipe f1$ … fn$)).

(pipe$ (f1$ … fn$ fn+1$ cont)) =

= (pipe$ f2$ … fn+1$ (lambda (f2-n$) (cont (lambda (x cont2) (f1$ x (lambda (res) (fn2-n$ res cont2))))))) =

= (

(lambda (f2-n$) (cont (lambda (x cont2) (f1$ x (lambda (res) (fn2-n$ res cont2))))))

(pipe f2$ … fn+1$)

) =

= (cont (lambda (x cont2) ((pipe f2$ … fn+1$) x (lambda (res) (fn2-n$ res cont2)))) =

= (cont (f2-n$ (pipe f1$ f2$ … fn+1$)) =

= (cont (pipe f1$ … fn+1$)).