A1:

```
list1 = iterate (\b -> if b then False else True) True

list2 = iterate (\i -> (-1)*(i*2)) 2

list3 = iterate (\x -> (fix(\s l i -> if i==(head l) then head(tail l)
                 else (s (tail l) i))) [n*(n+1)|n <- [1..]] x) 2
```

A2:

```
iterate' f = unfold (\x -> False) (\x -> x) (\y -> f y)

map' f = unfold (\xs -> xs == []) (\(x:xs) -> f x) (\(x:xs) -> xs)

int2bin n = rev (unfold (\n -> n==0) (\n -> mod n 2) (\n -> div n 2) n ) []
            where
              -- rev mit unfold möglich, aber unschön
              -- rev = unfold (\xs -> xs == []) (\xs -> last xs) (\xs -> init xs)
              rev []     ys = ys
              rev (x:xs) ys = rev xs (x:ys)
```

A3:

```
         T[ λx.y(yxy) ]
=>[3.Reg.] S ([elim x] y) ([elim x] yxy)
=>[2.Reg.] S (Ky) ([elim x] yxy)
=>[3.Reg.] S (Ky) (S ([elim x] yx) ([elim x] y))
=>[2.Reg.] S (Ky) (S ([elim x] yx) (Ky))
=>[3.Reg.] S (Ky) (S (S ([elim x] y) ([elim x] x)) (Ky))
=>[2.Reg.] S (Ky) (S (S (Ky) ([elim x] x)) (Ky))
=>[1.Reg.] S (Ky) (S (S (Ky) (I)) (Ky))
```

A4:

Haskell Funktionen:

```
reverse :: Eq a => [a] -> [a]
reverse xs = if xs == []
             then []
             else reverse (tail xs) ++ [(head xs)]

(++) :: Eq a => [a] -> [a] -> [a]
(++) xs ys = if xs == []
             then ys
             else (head xs):((++) (tail xs) ys)
```

Lambda Ausdrücke:

```
{CONCAT} ≡ Y(λcxy.(λite.ite)({NIL}x)(y)( {(:)} ({HEAD}x) (c({TAIL}x)y) )

{REVERSE} ≡ Y(λrx.(λite.ite)({NIL}x)(L)( {(:)} ({HEAD}x) ({CONCAT} ({TAIL}x)y) )
```

A5:

A6:

A7:

z.z.: $\forall n \in \mathbb{N}^+ : \sum_{i=1}^{n} i \cdot i! = (n+1)! - 1$

Es folgt ein Beweis über vollständige Induktion:

IA:

$n = 1$

$$\sum_{1}^{1} i \cdot i! = (1+1)! - 1$$
$$1 \cdot 1! = 2! - 1$$
$$1 \cdot 1 = 2 - 1$$
$$1 = 1$$

IV:

Für ein beliebiges, aber festes n gilt:

$$\sum_{i=1}^{n} i \cdot i! = (n+1)! - 1$$

IB:

Dann gilt auch:

$$\sum_{i=1}^{n+1} i \cdot i! = (n+2)! - 1$$

IS:

$$\sum_{i=1}^{n+1} i \cdot i! = (n+2)! - 1$$
$$\Rightarrow \left(\sum_{i=1}^{n} i \cdot i!\right) + ((n+1) \cdot (n+1)!) = (n+2)! - 1$$
$$\Rightarrow^{[IV]} ((n+1)! - 1) + ((n+1) \cdot (n+1)!) = (n+2)! - 1$$
$$\Rightarrow (n+1) \cdot (n+1)! + (n+1)! - 1 = (n+2)! - 1$$
$$\Rightarrow (n+2) \cdot (n+1)! - 1 = (n+2)! - 1$$
$$\Rightarrow (n+2) \cdot (n+1)! - 1 = (n+2)! - 1$$
$$\Rightarrow (n+2)! - 1 = (n+2)! - 1$$

Q.E.D.

A8:

A9: