

## Problem A

Consider the following declarations:

```
fun map f [] = []  
  | map f (x::xs) = (f x) :: map f xs
```

```
infix @ fun [] @ ys = ys  
  | (x::xs) @ ys = x :: (xs @ ys)
```

Prove

$$\text{map } f (l_1 @ l_2) = (\text{map } f l_1) @ (\text{map } f l_2) \quad (1)$$

## Problem B

Consider the declarations:

```
datatype 'a tree = Lf | Br of 'a * 'a tree * 'a tree
```

```
fun inorder Lf = []  
  | inorder(Br(x, t1, t2)) = inorder t1 @ (x :: inorder t2)
```

```
fun io(LF, xs) = xs  
  | io(Br(x, t1, t2), xs) = io(t1, x :: io(t2, xs))
```

Prove that

$$\text{inorder}(t) @ l = \text{io}(t, l) \quad (2)$$

for all  $t \in 'a \text{ tree}$  and  $l \in 'a \text{ list}$ . You may assume that  $@$  is associative.