2) Prove that rev_append and rev_append' are equivalent.

Using induction on l_1

Base Case: $l_1 = []$

rev_append [] l_2

$\overset{\text{by rev\_append}}{\Rightarrow}$ l_2

rev_append' [] l_2 = append (rev []) l_2

$\Rightarrow$ append (rev []) l_2

$\overset{\text{by rev}}{\Rightarrow}$ append [] l_2

$\overset{\text{by append}}{\Rightarrow}$ l_2

$\therefore$ Base Case proven.

Induction Hypothesis:

$\forall\, l_2$ rev_append t l_2 = rev_append' t l_2

<u>Step Case</u> $l_1 = h::t$

Assume The Induction Hypothesis

rev_append $h::t$ l_2

$\Rightarrow$ rev_append t $(H::l_2)$ by program

$\Rightarrow$ rev_append' t $(h::l_2)$ by I.H

① $\rightarrow$ (rev t) @ $(h::l_2)$ by program

rev_append' $(h::t)$ l_2

$\rightarrow$ rev' $(h::t)$ @ l_2 by evaluation of rev_append'

$\rightarrow$ ((rev t) @ [h]) @ l_2 by rev

$\rightarrow$ (rev t) @ ([h] @ l_2) by asso. of @

② $\rightarrow$ (rev t) @ $(h::l_2)$ by lemma

① = ② QED