2016 Reasoning

1)

(a) let $P(is) \equiv rev\ (flip\ is) = flip\ (rev\ is)$

inductive principle:

$$\left[P([\,]) \land \forall x : Int.\ \forall xs : [Int] \left(P(xs) \to P(x : xs) \right)\right] \to \forall xs : [Int].\ P(xs)$$

Base case:

to show $P([\,])$ holds

$P([\,]) \equiv rev\ (flip\ [\,]) = flip\ (rev\ [\,])$ by def.

$rev\ ([\,]) = flip\ ([\,])$ by def.

$[\,] = [\,]$

True

shown.

Inductive case

Inductive hypothesis: $P(xs)$ assume

to show: $P(x : xs)$

~~$rev\ (flip\ x : xs) = flip\ (rev\ x : xs)$~~

~~$= rev\ ([-x] ++ flip\ xs) = rev\ (flip\ xs) ++ rev\ [-x]$~~

~~$= flip\ (rev\ xs) + rev\ [-x]$~~

~~by hyp.~~

$rev\ (flip\ x : xs) = rev\ (flip\ [x] ++ flip\ xs)$

$= rev\ (flip\ xs) ++ rev\ (flip\ [x])$

$= flip\ (rev\ xs) ++ flip\ (rev\ [x])$ by hyp.

$= flip\ (rev\ xs ++ rev\ [x])$

$= flip\ (rev\ x : xs)$