

listas:

$$l ::= \underline{\text{nil}} \mid \underbrace{x :: l}_{\text{cons } x \text{ e } l}$$

$$|l| = \begin{cases} 0, & \text{se } l = \text{nil} \\ 1 + |l'|, & \text{se } l = a :: l' \end{cases}$$

$$l_1 \circ \text{nil} \stackrel{\text{def.}}{=} ?$$

$$l_1 \circ l_2 = \begin{cases} l_2, & \text{se } l_1 = \text{nil} \\ a :: (l' \circ l_2), & \text{se } l_1 = a :: l' \end{cases}$$

$$\text{nil} \circ l_1 \stackrel{\text{def.}}{=} l_1 \checkmark$$

$$\text{rev}(l) = \begin{cases} l, & \text{se } l = \text{nil} \\ (\text{rev}(l')) \circ (a :: \text{nil}), & \text{se } l = a :: l' \end{cases}$$

$$\perp \quad |l_1 \circ l_2| = |l_1| + |l_2|.$$

Indução em l_1 :

• $l_1 = \text{nil}$

$$|l_1 \circ l_2| = |\text{nil} \circ l_2| = |l_2| = 0 + |l_2| = |\text{nil}| + |l_2| = |l_1| + |l_2|.$$

• $l_1 = h :: \underline{tl}$

$$|l_1 \circ l_2| = |h :: \underline{tl} \circ l_2| \stackrel{\text{def.0}}{=} |h :: (tl \circ l_2)| \stackrel{\text{def.1.1}}{=} 1 + |tl \circ l_2|$$

$$\stackrel{\text{h.i.}}{=} 1 + \underline{|tl| + |l_2|} \stackrel{\text{def.1.1}}{=} \underline{|h :: tl| + |l_2|} = |l_1| + |l_2|. \quad \square$$