

# thm\_2Ellist\_2ELFLATTEN\_\_EQ\_\_NIL (TMZG3jEaonkp2Q2v1rPdHeZVs7fgS4inb9z)

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**Definition 1** We define  $c\_2Emin\_2E\_3D$  to be  $\lambda A.\lambda x \in A.\lambda y \in A.inj\_o (x = y)$  of type  $\iota \Rightarrow \iota$ .

**Definition 2** We define  $c\_2Ebool\_2E\_2T$  to be  $(ap (ap (c\_2Emin\_2E\_3D (2^2)) (\lambda V0x \in 2.V0x)) (\lambda V1x \in 2.V1x))$

**Definition 3** We define  $c\_2Ebool\_2E\_21$  to be  $\lambda A.\lambda 27a : \iota.(\lambda V0P \in (2^{A-27a}).(ap (ap (c\_2Emin\_2E\_3D (2^{A-27a}))$

**Definition 4** We define  $c\_2Ebool\_2E\_2F$  to be  $(ap (c\_2Ebool\_2E\_21 2) (\lambda V0t \in 2.V0t))$ .

**Definition 5** We define  $c\_2Emin\_2E\_3D\_3D\_3E$  to be  $\lambda P \in 2.\lambda Q \in 2.inj\_o (p \Rightarrow q)$  of type  $\iota$ .

**Definition 6** We define  $c\_2Ebool\_2E\_27E$  to be  $(\lambda V0t \in 2.(ap (ap c\_2Emin\_2E\_3D\_3D\_3E V0t) c\_2Ebool\_2E\_2F))$

**Definition 7** We define  $c\_2Ebool\_2E\_2F\_5C$  to be  $(\lambda V0t1 \in 2.(\lambda V1t2 \in 2.(ap (c\_2Ebool\_2E\_21 2) (\lambda V2t \in 2.V2t)))$

Let  $c\_2Enum\_2EZERO\_REP : \iota$  be given. Assume the following.

$$c\_2Enum\_2EZERO\_REP \in \omega \tag{1}$$

Let  $ty\_2Enum\_2Enum : \iota$  be given. Assume the following.

$$nonempty\ ty\_2Enum\_2Enum \tag{2}$$

Let  $c\_2Enum\_2EABS\_num : \iota$  be given. Assume the following.

$$c\_2Enum\_2EABS\_num \in (ty\_2Enum\_2Enum^{\omega}) \tag{3}$$

**Definition 8** We define  $c\_2Enum\_2E0$  to be  $(ap c\_2Enum\_2EABS\_num c\_2Enum\_2EZERO\_REP)$ .

**Definition 9** We define  $c\_2Earithmic\_2EZERO$  to be  $c\_2Enum\_2E0$ .

Let  $c\_2Enum\_2EREP\_num : \iota$  be given. Assume the following.

$$c\_2Enum\_2EREP\_num \in (\omega^{ty\_2Enum\_2Enum}) \tag{4}$$

Let  $c\_2Enum\_2ESUC\_REP : \iota$  be given. Assume the following.

$$c\_2Enum\_2ESUC\_REP \in (\omega^{\omega}) \tag{5}$$

**Definition 10** We define  $c\_2Enum\_2ESUC$  to be  $\lambda V0m \in ty\_2Enum\_2Enum.(ap\ c\_2Enum\_2EABS\_num$

Let  $c\_2Earithmetic\_2E\_2B : \iota$  be given. Assume the following.

$$c\_2Earithmetic\_2E\_2B \in ((ty\_2Enum\_2Enum^{ty\_2Enum\_2Enum})^{ty\_2Enum\_2Enum}) \quad (6)$$

**Definition 11** We define  $c\_2Earithmetic\_2EBIT1$  to be  $\lambda V0n \in ty\_2Enum\_2Enum.(ap\ (ap\ c\_2Earithmetic$

**Definition 12** We define  $c\_2Earithmetic\_2ENUMERAL$  to be  $\lambda V0x \in ty\_2Enum\_2Enum.V0x$ .

Let  $ty\_2Eoption\_2Eoption : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow nonempty\ (ty\_2Eoption\_2Eoption\ A0) \quad (7)$$

Let  $ty\_2Ellist\_2Ellist : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow nonempty\ (ty\_2Ellist\_2Ellist\ A0) \quad (8)$$

Let  $c\_2Ellist\_2Ellist\_rep : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow c\_2Ellist\_2Ellist\_rep\ A\_27a \in ((ty\_2Eoption\_2Eoption\ A\_27a)^{ty\_2Enum\_2Enum})^{(ty\_2Ellist\_2Ellist\ A\_27a)} \quad (9)$$

Let  $c\_2Ellist\_2Ellist\_abs : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow c\_2Ellist\_2Ellist\_abs\ A\_27a \in ((ty\_2Ellist\_2Ellist\ A\_27a)^{((ty\_2Eoption\_2Eoption\ A\_27a)^{ty\_2Enum\_2Enum})}) \quad (10)$$

Let  $ty\_2Eone\_2Eone : \iota$  be given. Assume the following.

$$nonempty\ ty\_2Eone\_2Eone \quad (11)$$

Let  $ty\_2Esum\_2Esum : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow \forall A1.nonempty\ A1 \Rightarrow nonempty\ (ty\_2Esum\_2Esum\ A0\ A1) \quad (12)$$

Let  $c\_2Esum\_2EABS\_sum : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow \forall A\_27b.nonempty\ A\_27b \Rightarrow c\_2Esum\_2EABS\_sum\ A\_27a\ A\_27b \in ((ty\_2Esum\_2Esum\ A\_27a\ A\_27b)^{((2^{A\_27b})^{A\_27a})^2}) \quad (13)$$

**Definition 13** We define  $c\_2Esum\_2EINL$  to be  $\lambda A\_27a : \iota.\lambda A\_27b : \iota.\lambda V0e \in A\_27a.(ap\ (c\_2Esum\_2EABS$

Let  $c\_2Eoption\_2Eoption\_ABS : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow c\_2Eoption\_2Eoption\_ABS\ A\_27a \in ((ty\_2Eoption\_2Eoption\ A\_27a)^{(ty\_2Esum\_2Esum\ A\_27a\ ty\_2Eone\_2Eone)}) \quad (14)$$

**Definition 14** We define  $c\_2Eoption\_2ESOME$  to be  $\lambda A\_27a : \iota. \lambda V0x \in A\_27a. (ap (c\_2Eoption\_2Eoption\_2ABS A\_27a) x)$

**Definition 15** We define  $c\_2Emin\_2E\_40$  to be  $\lambda A. \lambda P \in 2^A. \text{if } (\exists x \in A. P x) \text{ then } (\lambda x. x \in A \wedge P x)$  of type  $\iota \Rightarrow \iota$ .

**Definition 16** We define  $c\_2Eone\_2Eone$  to be  $(ap (c\_2Emin\_2E\_40 ty\_2Eone\_2Eone) (\lambda V0x \in ty\_2Eone\_2Eone. x))$

**Definition 17** We define  $c\_2Esum\_2EINR$  to be  $\lambda A\_27a : \iota. \lambda A\_27b : \iota. \lambda V0e \in A\_27b. (ap (c\_2Esum\_2EABS A\_27a A\_27b) e)$

**Definition 18** We define  $c\_2Eoption\_2ENONE$  to be  $\lambda A\_27a : \iota. (ap (c\_2Eoption\_2Eoption\_2ABS A\_27a) (c\_2Emin\_2E\_40 A\_27a))$

**Definition 19** We define  $c\_2Ellist\_2ELHD$  to be  $\lambda A\_27a : \iota. \lambda V0ll \in (ty\_2Ellist\_2Ellist A\_27a). (ap (ap (c\_2Eoption\_2Eoption\_2ABS A\_27a) (c\_2Emin\_2E\_40 A\_27a)) ll)$

Let  $c\_2Eoption\_2Eoption\_2CASE : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Assume the following.

$$\begin{aligned} \forall A\_27a. nonempty A\_27a \Rightarrow \forall A\_27b. nonempty A\_27b \Rightarrow c\_2Eoption\_2Eoption\_2CASE \\ A\_27a A\_27b \in (((A\_27b^{(A\_27b^{A\_27a})})^{A\_27b})^{(ty\_2Eoption\_2Eoption A\_27a)}) \end{aligned} \quad (15)$$

**Definition 20** We define  $c\_2Ellist\_2ELTL$  to be  $\lambda A\_27a : \iota. \lambda V0ll \in (ty\_2Ellist\_2Ellist A\_27a). (ap (ap (ap (c\_2Eoption\_2Eoption\_2CASE A\_27a) (c\_2Emin\_2E\_40 A\_27a)) ll) ll)$

Let  $c\_2Eoption\_2ETHE : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A\_27a. nonempty A\_27a \Rightarrow c\_2Eoption\_2ETHE A\_27a \in (A\_27a^{(ty\_2Eoption\_2Eoption A\_27a)}) \quad (16)$$

**Definition 21** We define  $c\_2Ellist\_2ELNIL$  to be  $\lambda A\_27a : \iota. (ap (c\_2Ellist\_2Ellist\_2abs A\_27a) (\lambda V0n \in ty\_2Ellist\_2Ellist A\_27a. n))$

**Definition 22** We define  $c\_2Ecombin\_2Eo$  to be  $\lambda A\_27a : \iota. \lambda A\_27b : \iota. \lambda A\_27c : \iota. \lambda V0f \in (A\_27b^{A\_27c}). \lambda V1g \in (A\_27c^{A\_27a}). (ap (ap (ap (c\_2Eoption\_2Eoption\_2CASE A\_27a) (c\_2Emin\_2E\_40 A\_27a)) g) f)$

Let  $c\_2Earithmetic\_2E\_2D : \iota$  be given. Assume the following.

$$c\_2Earithmetic\_2E\_2D \in ((ty\_2Enum\_2Enum^{ty\_2Enum\_2Enum})^{ty\_2Enum\_2Enum}) \quad (17)$$

**Definition 23** We define  $c\_2Ebool\_2ECOND$  to be  $\lambda A\_27a : \iota. (\lambda V0t \in 2. (\lambda V1t1 \in A\_27a. (\lambda V2t2 \in A\_27a. (ap (c\_2Eoption\_2Eoption\_2CASE A\_27a) (c\_2Emin\_2E\_40 A\_27a)) t2))) t1)$

**Definition 24** We define  $c\_2Ellist\_2ELCONS$  to be  $\lambda A\_27a : \iota. \lambda V0h \in A\_27a. \lambda V1t \in (ty\_2Ellist\_2Ellist A\_27a). (ap (ap (ap (c\_2Eoption\_2Eoption\_2CASE A\_27a) (c\_2Emin\_2E\_40 A\_27a)) t) h)$

**Definition 25** We define  $c\_2Ebool\_2E\_3F$  to be  $\lambda A\_27a : \iota. (\lambda V0P \in (2^{A\_27a}). (ap V0P (ap (c\_2Emin\_2E\_40 A\_27a) (c\_2Emin\_2E\_40 A\_27a))))$

**Definition 26** We define  $c\_2Ebool\_2E\_5C\_2F$  to be  $(\lambda V0t1 \in 2. (\lambda V1t2 \in 2. (ap (c\_2Ebool\_2E\_21 2) (\lambda V2t \in 2. (ap (c\_2Eoption\_2Eoption\_2CASE A\_27a) (c\_2Emin\_2E\_40 A\_27a)) t)))) t1 t2)$

**Definition 27** We define  $c\_2Ellist\_2Eexists$  to be  $\lambda A\_27a : \iota. (\lambda V0P \in (2^{A\_27a}). (\lambda V1a0 \in (ty\_2Ellist\_2Ellist A\_27a). (ap (ap (ap (c\_2Eoption\_2Eoption\_2CASE A\_27a) (c\_2Emin\_2E\_40 A\_27a)) a0) P)))$

**Definition 28** We define  $c\_2Ellist\_2Eevery$  to be  $\lambda A\_27a : \iota. \lambda V0P \in (2^{A\_27a}). \lambda V1ll \in (ty\_2Ellist\_2Ellist A\_27a). (ap (ap (ap (c\_2Eoption\_2Eoption\_2CASE A\_27a) (c\_2Emin\_2E\_40 A\_27a)) ll) P))$

Let  $c\_2Ellist\_2ELAPPEND : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow c\_2Ellist\_2ELAPPEND\ A\_27a \in (((ty\_2Ellist\_2Ellist\ A\_27a)^{(ty\_2Ellist\_2Ellist\ A\_27a)})^{(ty\_2Ellist\_2Ellist\ A\_27a)}) \quad (18)$$

Let  $c\_2Ellist\_2ELFLATTEN : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow c\_2Ellist\_2ELFLATTEN\ A\_27a \in ((ty\_2Ellist\_2Ellist\ A\_27a)^{(ty\_2Ellist\_2Ellist\ (ty\_2Ellist\_2Ellist\ A\_27a))}) \quad (19)$$

Assume the following.

$$True \quad (20)$$

Assume the following.

$$(\forall V0t1 \in 2. (\forall V1t2 \in 2. (((p\ V0t1) \Rightarrow (p\ V1t2)) \Rightarrow (((p\ V1t2) \Rightarrow (p\ V0t1)) \Rightarrow ((p\ V0t1) \Leftrightarrow (p\ V1t2)))))) \quad (21)$$

Assume the following.

$$(\forall V0t \in 2. (False \Rightarrow (p\ V0t))) \quad (22)$$

Assume the following.

$$(\forall V0t \in 2. (((True \wedge (p\ V0t)) \Leftrightarrow (p\ V0t)) \wedge (((p\ V0t) \wedge True) \Leftrightarrow (p\ V0t)) \wedge (((False \wedge (p\ V0t)) \Leftrightarrow False) \wedge (((p\ V0t) \wedge False) \Leftrightarrow False) \wedge (((p\ V0t) \wedge (p\ V0t)) \Leftrightarrow (p\ V0t)))))) \quad (23)$$

Assume the following.

$$(\forall V0t \in 2. (((True \Rightarrow (p\ V0t)) \Leftrightarrow (p\ V0t)) \wedge (((p\ V0t) \Rightarrow True) \Leftrightarrow True) \wedge (((False \Rightarrow (p\ V0t)) \Leftrightarrow True) \wedge (((p\ V0t) \Rightarrow (p\ V0t)) \Leftrightarrow True) \wedge (((p\ V0t) \Rightarrow False) \Leftrightarrow \neg(p\ V0t)))))) \quad (24)$$

Assume the following.

$$((\forall V0t \in 2. ((\neg(\neg(p\ V0t))) \Leftrightarrow (p\ V0t))) \wedge (((\neg True) \Leftrightarrow False) \wedge ((\neg False) \Leftrightarrow True))) \quad (25)$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow (\forall V0x \in A\_27a. ((V0x = V0x) \Leftrightarrow True)) \quad (26)$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow (\forall V0x \in A\_27a. (\forall V1y \in A\_27a. ((V0x = V1y) \Leftrightarrow (V1y = V0x)))) \quad (27)$$

Assume the following.

$$(\forall V0t \in 2. (((True \Leftrightarrow (p\ V0t)) \Leftrightarrow (p\ V0t)) \wedge (((p\ V0t) \Leftrightarrow True) \Leftrightarrow (p\ V0t)) \wedge (((False \Leftrightarrow (p\ V0t)) \Leftrightarrow \neg(p\ V0t)) \wedge (((p\ V0t) \Leftrightarrow False) \Leftrightarrow \neg(p\ V0t)))))) \quad (28)$$

Assume the following.

$$(\forall V0t1 \in 2.(\forall V1t2 \in 2.(\forall V2t3 \in 2.(((p V0t1) \Rightarrow ((p V1t2) \Rightarrow (p V2t3))) \Leftrightarrow (((p V0t1) \wedge (p V1t2)) \Rightarrow (p V2t3)))))) \quad (29)$$

Assume the following.

$$(\forall V0x \in 2.(\forall V1x_{.27} \in 2.(\forall V2y \in 2.(\forall V3y_{.27} \in 2.(((p V0x) \Leftrightarrow (p V1x_{.27})) \wedge ((p V1x_{.27}) \Rightarrow ((p V2y) \Leftrightarrow (p V3y_{.27})))))) \Rightarrow ((p V0x) \Rightarrow (p V2y)) \Leftrightarrow ((p V1x_{.27}) \Rightarrow (p V3y_{.27})))))) \quad (30)$$

Assume the following.

$$\begin{aligned} \forall A_{.27a}.nonempty A_{.27a} \Rightarrow (\forall V0P \in 2.(\forall V1Q \in 2. \\ (\forall V2x \in A_{.27a}.(\forall V3x_{.27} \in A_{.27a}.(\forall V4y \in A_{.27a}. \\ (\forall V5y_{.27} \in A_{.27a}.(((p V0P) \Leftrightarrow (p V1Q)) \wedge ((p V1Q) \Rightarrow (V2x = V3x_{.27})) \wedge \\ ((\neg(p V1Q)) \Rightarrow (V4y = V5y_{.27})))) \Rightarrow ((ap (ap (ap (c_{.2Ebool_{.2ECOND}} A_{.27a}) \\ V0P) V2x) V4y) = (ap (ap (ap (c_{.2Ebool_{.2ECOND}} A_{.27a}) V1Q) V3x_{.27}) \\ V5y_{.27})))))))))) \quad (31) \end{aligned}$$

Assume the following.

$$\begin{aligned} \forall A_{.27a}.nonempty A_{.27a} \Rightarrow ((\forall V0t1 \in A_{.27a}.(\forall V1t2 \in \\ A_{.27a}.((ap (ap (ap (c_{.2Ebool_{.2ECOND}} A_{.27a}) c_{.2Ebool_{.2ET}} V0t1) \\ V1t2) = V0t1))) \wedge (\forall V2t1 \in A_{.27a}.(\forall V3t2 \in A_{.27a}.((ap \\ (ap (ap (c_{.2Ebool_{.2ECOND}} A_{.27a}) c_{.2Ebool_{.2EF}} V2t1) V3t2) = V3t2)))))) \quad (32) \end{aligned}$$

Assume the following.

$$\begin{aligned} \forall A_{.27a}.nonempty A_{.27a} \Rightarrow (\forall V0l1 \in (ty_{.2Ellist_{.2Ellist}} \\ A_{.27a}).(\forall V1l2 \in (ty_{.2Ellist_{.2Ellist}} A_{.27a}).(((ap (ap ( \\ c_{.2Ellist_{.2ELAPPEND}} A_{.27a}) V0l1) V1l2) = (c_{.2Ellist_{.2ELNIL}} A_{.27a})) \Leftrightarrow \\ ((V0l1 = (c_{.2Ellist_{.2ELNIL}} A_{.27a})) \wedge (V1l2 = (c_{.2Ellist_{.2ELNIL}} \\ A_{.27a})))))) \quad (33) \end{aligned}$$

Assume the following.

$$\begin{aligned} \forall A_{.27a}.nonempty A_{.27a} \Rightarrow (\forall V0P \in (2^{A_{.27a}}).(\forall V1Q \in \\ (2^{(ty_{.2Ellist_{.2Ellist}} A_{.27a})}).((\forall V2h \in A_{.27a}.(\forall V3t \in \\ (ty_{.2Ellist_{.2Ellist}} A_{.27a}).((p (ap V1Q (ap (ap (c_{.2Ellist_{.2ELCONS}} \\ A_{.27a}) V2h) V3t))) \Rightarrow ((p (ap V0P V2h)) \wedge (p (ap V1Q V3t)))))) \Rightarrow (\forall V4ll \in \\ (ty_{.2Ellist_{.2Ellist}} A_{.27a}).((p (ap V1Q V4ll)) \Rightarrow (p (ap (ap (c_{.2Ellist_{.2EVERY}} \\ A_{.27a}) V0P) V4ll)))))) \quad (34) \end{aligned}$$

Assume the following.

$$\begin{aligned}
& \forall A_{.27a}.nonempty\ A_{.27a} \Rightarrow (\forall V0ll \in (ty\_2Ellist\_2Ellist \\
& (ty\_2Ellist\_2Ellist\ A_{.27a})).((ap\ (c\_2Ellist\_2ELFLATTEN\ A_{.27a}) \\
& V0ll) = (ap\ (ap\ (ap\ (c\_2Ebool\_2ECOND\ (ty\_2Ellist\_2Ellist\ A_{.27a})) \\
& (ap\ (ap\ (c\_2Ellist\_2Eevery\ (ty\_2Ellist\_2Ellist\ A_{.27a}))\ (ap\ (c\_2Emin\_2E\_3D \\
& (ty\_2Ellist\_2Ellist\ A_{.27a}))\ (c\_2Ellist\_2ELNIL\ A_{.27a})))\ V0ll)) \\
& (c\_2Ellist\_2ELNIL\ A_{.27a}))\ (ap\ (ap\ (ap\ (c\_2Ebool\_2ECOND\ (ty\_2Ellist\_2Ellist \\
& A_{.27a}))\ (ap\ (ap\ (c\_2Emin\_2E\_3D\ (ty\_2Ellist\_2Ellist\ A_{.27a}))\ (ap \\
& (c\_2Eoption\_2ETHE\ (ty\_2Ellist\_2Ellist\ A_{.27a}))\ (ap\ (c\_2Ellist\_2ELHD \\
& (ty\_2Ellist\_2Ellist\ A_{.27a}))\ V0ll))))\ (c\_2Ellist\_2ELNIL\ A_{.27a}))) \\
& (ap\ (c\_2Ellist\_2ELFLATTEN\ A_{.27a})\ (ap\ (c\_2Eoption\_2ETHE\ (ty\_2Ellist\_2Ellist \\
& (ty\_2Ellist\_2Ellist\ A_{.27a})))\ (ap\ (c\_2Ellist\_2ELTL\ (ty\_2Ellist\_2Ellist \\
& A_{.27a}))\ V0ll))))\ (ap\ (ap\ (c\_2Ellist\_2ELCONS\ A_{.27a})\ (ap\ (c\_2Eoption\_2ETHE \\
& A_{.27a})\ (ap\ (c\_2Ellist\_2ELHD\ A_{.27a})\ (ap\ (c\_2Eoption\_2ETHE\ (ty\_2Ellist\_2Ellist \\
& A_{.27a}))\ (ap\ (c\_2Ellist\_2ELHD\ (ty\_2Ellist\_2Ellist\ A_{.27a}))\ V0ll)))))) \\
& (ap\ (c\_2Ellist\_2ELFLATTEN\ A_{.27a})\ (ap\ (ap\ (c\_2Ellist\_2ELCONS\ ( \\
& ty\_2Ellist\_2Ellist\ A_{.27a}))\ (ap\ (c\_2Eoption\_2ETHE\ (ty\_2Ellist\_2Ellist \\
& A_{.27a}))\ (ap\ (c\_2Ellist\_2ELTL\ A_{.27a})\ (ap\ (c\_2Eoption\_2ETHE\ (ty\_2Ellist\_2Ellist \\
& A_{.27a}))\ (ap\ (c\_2Ellist\_2ELHD\ (ty\_2Ellist\_2Ellist\ A_{.27a}))\ V0ll)))))) \\
& (ap\ (c\_2Eoption\_2ETHE\ (ty\_2Ellist\_2Ellist\ (ty\_2Ellist\_2Ellist \\
& A_{.27a})))\ (ap\ (c\_2Ellist\_2ELTL\ (ty\_2Ellist\_2Ellist\ A_{.27a}))\ V0ll))))))))) \\
& \hspace{15em} (35)
\end{aligned}$$

Assume the following.

$$\begin{aligned}
& \forall A_{.27a}.nonempty\ A_{.27a} \Rightarrow (\forall V0h \in (ty\_2Ellist\_2Ellist \\
& A_{.27a}).(\forall V1t \in (ty\_2Ellist\_2Ellist\ (ty\_2Ellist\_2Ellist \\
& A_{.27a})).((ap\ (c\_2Ellist\_2ELFLATTEN\ A_{.27a})\ (ap\ (ap\ (c\_2Ellist\_2ELCONS \\
& (ty\_2Ellist\_2Ellist\ A_{.27a}))\ V0h)\ V1t)) = (ap\ (ap\ (c\_2Ellist\_2ELAPPEND \\
& A_{.27a})\ V0h)\ (ap\ (c\_2Ellist\_2ELFLATTEN\ A_{.27a})\ V1t)))))) \\
& \hspace{15em} (36)
\end{aligned}$$

**Theorem 1**

$$\begin{aligned}
& \forall A_{.27a}.nonempty\ A_{.27a} \Rightarrow (\forall V0ll \in (ty\_2Ellist\_2Ellist \\
& (ty\_2Ellist\_2Ellist\ A_{.27a})).(((ap\ (c\_2Ellist\_2ELFLATTEN\ A_{.27a}) \\
& V0ll) = (c\_2Ellist\_2ELNIL\ A_{.27a})) \Leftrightarrow (p\ (ap\ (ap\ (c\_2Ellist\_2Eevery \\
& (ty\_2Ellist\_2Ellist\ A_{.27a}))\ (ap\ (c\_2Emin\_2E\_3D\ (ty\_2Ellist\_2Ellist \\
& A_{.27a}))\ (c\_2Ellist\_2ELNIL\ A_{.27a})))\ V0ll))))
\end{aligned}$$