

thm_2EHolSmt_2Er108
(TMPNw3e6he9P9w63Xb4KaskBdigydGYKx5G)

October 26, 2020

Definition 1 We define $c_2Emin_2E_40$ to be $\lambda A.\lambda P \in 2^A.$ **if** $(\exists x \in A.p (ap P x))$ **then** $(the (\lambda x.x \in A \wedge p x))$ of type $\iota \Rightarrow \iota$.

Definition 2 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 3 We define $c_2Ebool_2E_3F$ to be $\lambda A.27a : \iota.(\lambda V0P \in (2^{A-27a}).(ap V0P (ap (c_2Emin_2E_40 A))))$

Let $ty_2Enum_2Enum : \iota$ be given. Assume the following.

$$nonempty\ ty_2Enum_2Enum \tag{1}$$

Let $ty_2Epair_2Eprod : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow \forall A1.nonempty\ A1 \Rightarrow nonempty\ (ty_2Epair_2Eprod\ A0\ A1) \tag{2}$$

Let $ty_2Einteger_2Eint : \iota$ be given. Assume the following.

$$nonempty\ ty_2Einteger_2Eint \tag{3}$$

Let $c_2Einteger_2Eint_REP_CLASS : \iota$ be given. Assume the following.

$$c_2Einteger_2Eint_REP_CLASS \in ((2^{(ty_2Epair_2Eprod\ ty_2Enum_2Enum\ ty_2Enum_2Enum)})_{ty_2Einteger_2Eint}) \tag{4}$$

Definition 4 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 5 We define $c_2Ebool_2E_21$ to be $\lambda A.27a : \iota.(\lambda V0P \in (2^{A-27a}).(ap (ap (c_2Emin_2E_3D (2^{A-27a})) (ap V0P (ap (c_2Emin_2E_40 A))))))$

Definition 6 We define $c_2Einteger_2Eint_REP$ to be $\lambda V0a \in ty_2Einteger_2Eint.(ap (c_2Emin_2E_40 (ty_2Epair_2Eprod\ ty_2Enum_2Enum\ ty_2Enum_2Enum)))$

Let $c_2Einteger_2Eint_lt : \iota$ be given. Assume the following.

$$c_2Einteger_2Eint_lt \in ((2^{(ty_2Epair_2Eprod\ ty_2Enum_2Enum\ ty_2Enum_2Enum)})_{ty_2Einteger_2Eint_lt}) \tag{5}$$

Definition 7 We define $c_Einteger_Eint_lt$ to be $\lambda V0T1 \in ty_Einteger_Eint.\lambda V1T2 \in ty_Einteger_Eint$.

Definition 8 We define c_Ebool_EF to be $(ap (c_Ebool_E21\ 2) (\lambda V0t \in 2.V0t))$.

Definition 9 We define $c_Emin_E3D_3D_3E$ to be $\lambda P \in 2.\lambda Q \in 2.inj_o (p P \Rightarrow p Q)$ of type ι .

Definition 10 We define c_Ebool_E7E to be $(\lambda V0t \in 2.(ap (ap c_Emin_E3D_3D_3E V0t) c_Ebool_E21\ 2))$.

Definition 11 We define $c_Einteger_Eint_le$ to be $\lambda V0x \in ty_Einteger_Eint.\lambda V1y \in ty_Einteger_Eint$.

Definition 12 We define $c_Einteger_Eint_ge$ to be $\lambda V0x \in ty_Einteger_Eint.\lambda V1y \in ty_Einteger_Eint$.

Let $c_EEnum_EZERO_REP : \iota$ be given. Assume the following.

$$c_EEnum_EZERO_REP \in \omega \tag{6}$$

Let $c_EEnum_EABS_num : \iota$ be given. Assume the following.

$$c_EEnum_EABS_num \in (ty_EEnum_EEnum^{\omega}) \tag{7}$$

Definition 13 We define c_EEnum_E0 to be $(ap c_EEnum_EABS_num c_EEnum_EZERO_REP)$.

Definition 14 We define $c_Earithmic_EZERO$ to be c_EEnum_E0 .

Let $c_Einteger_Eint_mul : \iota$ be given. Assume the following.

$$c_Einteger_Eint_mul \in (((ty_Epair_Eprod ty_EEnum_EEnum ty_EEnum_EEnum)_{(ty_Epair_Eprod ty_EEnum_EEnum ty_EEnum_EEnum)})_{(ty_Epair_Eprod ty_EEnum_EEnum ty_EEnum_EEnum)})_{(ty_Epair_Eprod ty_EEnum_EEnum ty_EEnum_EEnum)} \tag{8}$$

Let $c_Einteger_Eint_eq : \iota$ be given. Assume the following.

$$c_Einteger_Eint_eq \in ((2^{(ty_Epair_Eprod ty_EEnum_EEnum ty_EEnum_EEnum)})_{(ty_Epair_Eprod ty_EEnum_EEnum ty_EEnum_EEnum)})_{(ty_Epair_Eprod ty_EEnum_EEnum ty_EEnum_EEnum)} \tag{9}$$

Let $c_Einteger_Eint_ABS_CLASS : \iota$ be given. Assume the following.

$$c_Einteger_Eint_ABS_CLASS \in (ty_Einteger_Eint)^{(2^{(ty_Epair_Eprod ty_EEnum_EEnum ty_EEnum_EEnum)})_{(ty_Epair_Eprod ty_EEnum_EEnum ty_EEnum_EEnum)}} \tag{10}$$

Definition 15 We define $c_Einteger_Eint_ABS$ to be $\lambda V0r \in (ty_Epair_Eprod ty_EEnum_EEnum ty_EEnum_EEnum)$.

Definition 16 We define $c_Einteger_Eint_mul$ to be $\lambda V0T1 \in ty_Einteger_Eint.\lambda V1T2 \in ty_Einteger_Eint$.

Let $c_Earithmic_E2D : \iota$ be given. Assume the following.

$$c_Earithmic_E2D \in ((ty_EEnum_EEnum^{ty_EEnum_EEnum})_{ty_EEnum_EEnum})_{ty_EEnum_EEnum} \tag{11}$$

Definition 17 We define $c_Ebool_E2F_5C$ to be $(\lambda V0t1 \in 2.(\lambda V1t2 \in 2.(ap (c_Ebool_E21\ 2) (\lambda V2t \in 2.V2t))))$.

Let $c_2Enum_2EREP_num : \iota$ be given. Assume the following.

$$c_2Enum_2EREP_num \in (\omega^{ty_2Enum_2Enum}) \quad (12)$$

Let $c_2Enum_2ESUC_REP : \iota$ be given. Assume the following.

$$c_2Enum_2ESUC_REP \in (\omega^{\omega}) \quad (13)$$

Definition 18 We define c_2Enum_2ESUC to be $\lambda V0m \in ty_2Enum_2Enum.(ap\ c_2Enum_2EABS_num$

Definition 19 We define $c_2Eprim_rec_2E_3C$ to be $\lambda V0m \in ty_2Enum_2Enum.\lambda V1n \in ty_2Enum_2Enum$

Definition 20 We define $c_2Ebool_2E_5C_2F$ to be $(\lambda V0t1 \in 2.(\lambda V1t2 \in 2.(ap\ (c_2Ebool_2E_21\ 2)\ (\lambda V2t \in$

Definition 21 We define $c_2Earithmetic_2E_3C_3D$ to be $\lambda V0m \in ty_2Enum_2Enum.\lambda V1n \in ty_2Enum_2Enum$

Definition 22 We define c_2Ebool_2ECOND to be $\lambda A_27a : \iota.(\lambda V0t \in 2.(\lambda V1t1 \in A_27a.(\lambda V2t2 \in A_27a.($

Let $c_2Earithmetic_2E_2B : \iota$ be given. Assume the following.

$$c_2Earithmetic_2E_2B \in ((ty_2Enum_2Enum)^{ty_2Enum_2Enum})^{ty_2Enum_2Enum} \quad (14)$$

Definition 23 We define $c_2Enumeral_2EiZ$ to be $\lambda V0x \in ty_2Enum_2Enum.V0x$.

Let $c_2Einteger_2Etint_add : \iota$ be given. Assume the following.

$$c_2Einteger_2Etint_add \in (((ty_2Epair_2Eprod\ ty_2Enum_2Enum\ ty_2Enum_2Enum)^{(ty_2Epair_2Eprod\ ty_2Enum_2Enum\ ty_2Enum_2Enum)})^{(ty_2Epair_2Eprod\ ty_2Enum_2Enum\ ty_2Enum_2Enum)}) \quad (15)$$

Definition 24 We define $c_2Einteger_2Eint_add$ to be $\lambda V0T1 \in ty_2Einteger_2Eint.\lambda V1T2 \in ty_2Einteger_2Eint$

Let $c_2Einteger_2Etint_neg : \iota$ be given. Assume the following.

$$c_2Einteger_2Etint_neg \in ((ty_2Epair_2Eprod\ ty_2Enum_2Enum\ ty_2Enum_2Enum)^{(ty_2Epair_2Eprod\ ty_2Enum_2Enum\ ty_2Enum_2Enum)}) \quad (16)$$

Definition 25 We define $c_2Einteger_2Eint_neg$ to be $\lambda V0T1 \in ty_2Einteger_2Eint.(ap\ c_2Einteger_2Eint$

Definition 26 We define $c_2Earithmetic_2EBIT2$ to be $\lambda V0n \in ty_2Enum_2Enum.(ap\ (ap\ c_2Earithmetic$

Definition 27 We define $c_2Earithmetic_2EBIT1$ to be $\lambda V0n \in ty_2Enum_2Enum.(ap\ (ap\ c_2Earithmetic$

Definition 28 We define $c_2Earithmetic_2ENUMERAL$ to be $\lambda V0x \in ty_2Enum_2Enum.V0x$.

Let $c_2Einteger_2Eint_of_num : \iota$ be given. Assume the following.

$$c_2Einteger_2Eint_of_num \in (ty_2Einteger_2Eint^{ty_2Enum_2Enum}) \quad (17)$$

Assume the following.

$$True \quad (18)$$

Assume the following.

$$(\forall V0t1 \in 2. (\forall V1t2 \in 2. ((p V0t1) \Rightarrow (p V1t2)) \Rightarrow ((p V1t2) \Rightarrow (p V0t1)) \Rightarrow ((p V0t1) \Leftrightarrow (p V1t2)))) \quad (19)$$

Assume the following.

$$(\forall V0t \in 2. (False \Rightarrow (p V0t))) \quad (20)$$

Assume the following.

$$(\forall V0t \in 2. ((p V0t) \vee (\neg(p V0t)))) \quad (21)$$

Assume the following.

$$\forall A_27a.nonempty A_27a \Rightarrow (\forall V0t \in 2. ((\exists V1x \in A_27a. (p V0t)) \Leftrightarrow (p V0t))) \quad (22)$$

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.

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

Assume the following.

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

Assume the following.

$$((\forall V0t \in 2. ((\neg(\neg(p V0t))) \Leftrightarrow (p V0t)) \wedge ((\neg True) \Leftrightarrow False) \wedge ((\neg False) \Leftrightarrow True))) \quad (26)$$

Assume the following.

$$\forall A_27a.nonempty A_27a \Rightarrow (\forall V0x \in A_27a. ((V0x = V0x) \Leftrightarrow True)) \quad (27)$$

Assume the following.

$$\forall A.27a.nonempty\ A.27a \Rightarrow (\forall V0x \in A.27a. (\forall V1y \in A.27a. ((V0x = V1y) \Leftrightarrow (V1y = V0x)))) \quad (28)$$

Assume the following.

$$(\forall V0t \in 2. (((True \Leftrightarrow (p\ V0t)) \Leftrightarrow (p\ V0t)) \wedge (((p\ V0t) \Leftrightarrow True) \Leftrightarrow (p\ V0t)) \wedge (((False \Leftrightarrow (p\ V0t)) \Leftrightarrow \neg(p\ V0t)) \wedge (((p\ V0t) \Leftrightarrow False) \Leftrightarrow \neg(p\ V0t)))))) \quad (29)$$

Assume the following.

$$\forall A.27a.nonempty\ A.27a \Rightarrow (\forall V0P \in (2^{A.27a}). (\neg(\exists V1x \in A.27a. (p\ (ap\ V0P\ V1x)))) \Leftrightarrow (\forall V2x \in A.27a. (\neg(p\ (ap\ V0P\ V2x)))))) \quad (30)$$

Assume the following.

$$(\forall V0x \in ty_2Einteger_2Eint. (\forall V1y \in ty_2Einteger_2Eint. ((p\ (ap\ (ap\ c_2Einteger_2Eint_lt\ V0x)\ V1y)) \Leftrightarrow (p\ (ap\ (ap\ c_2Einteger_2Eint_le\ (ap\ (ap\ c_2Einteger_2Eint_add\ V0x)\ (ap\ c_2Einteger_2Eint_of_num\ (ap\ c_2Earithmic_2ENUMERAL\ (ap\ c_2Earithmic_2EBIT1\ c_2Earithmic_2EZERO))))))\ V1y)))))) \quad (31)$$

Assume the following.

$$(\forall V0x \in ty_2Einteger_2Eint. (\forall V1y \in ty_2Einteger_2Eint. ((p\ (ap\ (ap\ c_2Einteger_2Eint_le\ V0x)\ V1y)) \Leftrightarrow (p\ (ap\ (ap\ c_2Einteger_2Eint_le\ (ap\ c_2Einteger_2Eint_of_num\ c_2Enum_2E0))\ (ap\ (ap\ c_2Einteger_2Eint_add\ V1y)\ (ap\ c_2Einteger_2Eint_neg\ V0x)))))) \quad (32)$$

Assume the following.

$$(\forall V0c \in ty_2Einteger_2Eint. (\forall V1x \in ty_2Einteger_2Eint. (\forall V2y \in ty_2Einteger_2Eint. ((p\ (ap\ (ap\ c_2Einteger_2Eint_le\ (ap\ c_2Einteger_2Eint_of_num\ c_2Enum_2E0))\ (ap\ (ap\ c_2Einteger_2Eint_add\ V0c)\ V1x))) \Rightarrow ((p\ (ap\ (ap\ c_2Einteger_2Eint_lt\ V2y)\ (ap\ c_2Einteger_2Eint_neg\ V1x))) \Rightarrow ((p\ (ap\ (ap\ c_2Einteger_2Eint_le\ (ap\ c_2Einteger_2Eint_of_num\ c_2Enum_2E0))\ (ap\ (ap\ c_2Einteger_2Eint_add\ (ap\ c_2Einteger_2Eint_neg\ V0c)\ V2y))) \Leftrightarrow False)))))) \quad (33)$$

Assume the following.

$$(\forall V0y \in ty_2Einteger_2Eint. (\forall V1x \in ty_2Einteger_2Eint. ((ap\ (ap\ c_2Einteger_2Eint_add\ V1x)\ V0y) = (ap\ (ap\ c_2Einteger_2Eint_add\ V0y)\ V1x)))) \quad (34)$$

Assume the following.

$$\begin{aligned}
& (\forall V0z \in ty_2Einteger_2Eint. (\forall V1y \in ty_2Einteger_2Eint. \\
& (\forall V2x \in ty_2Einteger_2Eint. ((ap (ap c_2Einteger_2Eint_add \\
V2x) (ap (ap c_2Einteger_2Eint_add V1y) V0z)) = (ap (ap c_2Einteger_2Eint_add \\
& (ap (ap c_2Einteger_2Eint_add V2x) V1y)) V0z))))))
\end{aligned} \tag{35}$$

Assume the following.

$$(\forall V0x \in ty_2Einteger_2Eint. ((ap (ap c_2Einteger_2Eint_add V0x) (ap c_2Einteger_2Eint_of_num c_2Enum_2E0)) = V0x)) \tag{36}$$

Assume the following.

$$\begin{aligned}
& (\forall V0x \in ty_2Einteger_2Eint. ((ap (ap c_2Einteger_2Eint_mul \\
& (ap c_2Einteger_2Eint_of_num (ap c_2Earithmic_2ENUMERAL \\
& (ap c_2Earithmic_2EBIT1 c_2Earithmic_2EZERO)))) V0x) = V0x))
\end{aligned} \tag{37}$$

Assume the following.

$$\begin{aligned}
& (\forall V0x \in ty_2Einteger_2Eint. (\forall V1y \in ty_2Einteger_2Eint. \\
& ((ap c_2Einteger_2Eint_neg (ap (ap c_2Einteger_2Eint_add V0x) \\
V1y)) = (ap (ap c_2Einteger_2Eint_add (ap c_2Einteger_2Eint_neg \\
& V0x)) (ap c_2Einteger_2Eint_neg V1y))))))
\end{aligned} \tag{38}$$

Assume the following.

$$\begin{aligned}
& (\forall V0x \in ty_2Einteger_2Eint. (\forall V1y \in ty_2Einteger_2Eint. \\
& ((ap c_2Einteger_2Eint_neg (ap (ap c_2Einteger_2Eint_mul V0x) \\
V1y)) = (ap (ap c_2Einteger_2Eint_mul (ap c_2Einteger_2Eint_neg \\
& V0x)) V1y))))))
\end{aligned} \tag{39}$$

Assume the following.

$$\begin{aligned}
& (\forall V0x \in ty_2Einteger_2Eint. (\forall V1y \in ty_2Einteger_2Eint. \\
& ((ap c_2Einteger_2Eint_neg (ap (ap c_2Einteger_2Eint_mul V0x) \\
V1y)) = (ap (ap c_2Einteger_2Eint_mul V0x) (ap c_2Einteger_2Eint_neg \\
& V1y))))))
\end{aligned} \tag{40}$$

Assume the following.

$$(\forall V0x \in ty_2Einteger_2Eint. ((ap c_2Einteger_2Eint_neg (ap c_2Einteger_2Eint_neg V0x)) = V0x)) \tag{41}$$

Assume the following.

$$\begin{aligned}
& (\forall V0x \in ty_2Einteger_2Eint. (\forall V1y \in ty_2Einteger_2Eint. \\
& ((\neg(p (ap (ap c_2Einteger_2Eint_le V0x) V1y))) \Leftrightarrow (p (ap (ap c_2Einteger_2Eint_lt \\
& V1y) V0x))))))
\end{aligned} \tag{42}$$

Assume the following.

$$((ap\ c_2Einteger_2Eint_neg\ (ap\ c_2Einteger_2Eint_of_num\ c_2Enum_2E0)) = (ap\ c_2Einteger_2Eint_of_num\ c_2Enum_2E0)) \quad (43)$$

Assume the following.

$$\begin{aligned} & (\forall V0p \in ty_2Einteger_2Eint. (\forall V1n \in ty_2Enum_2Enum. \\ & (\forall V2m \in ty_2Enum_2Enum. (((ap\ (ap\ c_2Einteger_2Eint_add \\ & (ap\ c_2Einteger_2Eint_of_num\ c_2Enum_2E0))\ V0p) = V0p) \wedge (((\\ & ap\ (ap\ c_2Einteger_2Eint_add\ V0p)\ (ap\ c_2Einteger_2Eint_of_num \\ & c_2Enum_2E0)) = V0p) \wedge (((ap\ c_2Einteger_2Eint_neg\ (ap\ c_2Einteger_2Eint_of_num \\ & c_2Enum_2E0)) = (ap\ c_2Einteger_2Eint_of_num\ c_2Enum_2E0)) \wedge \\ & (((ap\ c_2Einteger_2Eint_neg\ (ap\ c_2Einteger_2Eint_neg\ V0p)) = \\ & V0p) \wedge (((ap\ (ap\ c_2Einteger_2Eint_add\ (ap\ c_2Einteger_2Eint_of_num \\ & (ap\ c_2Earithmetic_2ENUMERAL\ V1n)))\ (ap\ c_2Einteger_2Eint_of_num \\ & (ap\ c_2Earithmetic_2ENUMERAL\ V2m))) = (ap\ c_2Einteger_2Eint_of_num \\ & (ap\ c_2Earithmetic_2ENUMERAL\ (ap\ c_2Enumeral_2EiZ\ (ap\ (ap\ c_2Earithmetic_2E_2B \\ & V1n)\ V2m)))))) \wedge (((ap\ (ap\ c_2Einteger_2Eint_add\ (ap\ c_2Einteger_2Eint_of_num \\ & (ap\ c_2Earithmetic_2ENUMERAL\ V1n)))\ (ap\ c_2Einteger_2Eint_neg \\ & (ap\ c_2Einteger_2Eint_of_num\ (ap\ c_2Earithmetic_2ENUMERAL \\ & V2m)))) = (ap\ (ap\ (ap\ (c_2Ebool_2ECOND\ ty_2Einteger_2Eint)\ (ap \\ & (ap\ c_2Earithmetic_2E_3C_3D\ V2m)\ V1n))\ (ap\ c_2Einteger_2Eint_of_num \\ & (ap\ c_2Earithmetic_2ENUMERAL\ (ap\ (ap\ c_2Earithmetic_2E_2D\ V1n) \\ & V2m))))\ (ap\ c_2Einteger_2Eint_neg\ (ap\ c_2Einteger_2Eint_of_num \\ & (ap\ c_2Earithmetic_2ENUMERAL\ (ap\ (ap\ c_2Earithmetic_2E_2D\ V2m) \\ & V1n)))))) \wedge (((ap\ (ap\ c_2Einteger_2Eint_add\ (ap\ c_2Einteger_2Eint_neg \\ & (ap\ c_2Einteger_2Eint_of_num\ (ap\ c_2Earithmetic_2ENUMERAL \\ & V1n)))\ (ap\ c_2Einteger_2Eint_of_num\ (ap\ c_2Earithmetic_2ENUMERAL \\ & V2m))) = (ap\ (ap\ (ap\ (c_2Ebool_2ECOND\ ty_2Einteger_2Eint)\ (ap\ (\\ & ap\ c_2Earithmetic_2E_3C_3D\ V1n)\ V2m))\ (ap\ c_2Einteger_2Eint_of_num \\ & (ap\ c_2Earithmetic_2ENUMERAL\ (ap\ (ap\ c_2Earithmetic_2E_2D\ V2m) \\ & V1n))))\ (ap\ c_2Einteger_2Eint_neg\ (ap\ c_2Einteger_2Eint_of_num \\ & (ap\ c_2Earithmetic_2ENUMERAL\ (ap\ (ap\ c_2Earithmetic_2E_2D\ V1n) \\ & V2m)))))) \wedge (((ap\ (ap\ c_2Einteger_2Eint_add\ (ap\ c_2Einteger_2Eint_neg \\ & (ap\ c_2Einteger_2Eint_of_num\ (ap\ c_2Earithmetic_2ENUMERAL \\ & V1n)))\ (ap\ c_2Einteger_2Eint_neg\ (ap\ c_2Einteger_2Eint_of_num \\ & (ap\ c_2Earithmetic_2ENUMERAL\ V2m)))) = (ap\ c_2Einteger_2Eint_neg \\ & (ap\ c_2Einteger_2Eint_of_num\ (ap\ c_2Earithmetic_2ENUMERAL \\ & (ap\ c_2Enumeral_2EiZ\ (ap\ (ap\ c_2Earithmetic_2E_2B\ V1n)\ V2m))))))))))))) \end{aligned} \quad (44)$$

Assume the following.

$$\begin{aligned}
& (\forall V0n \in ty_2Enum_2Enum. (\forall V1m \in ty_2Enum_2Enum. (\\
& \quad ((p (ap (ap c_2Integer_2Eint_lt (ap c_2Integer_2Eint_of_num \\
& \quad c_2Enum_2E0)) (ap c_2Integer_2Eint_of_num (ap c_2Arithmetic_2ENUMERAL \\
& \quad (ap c_2Arithmetic_2EBIT1 V0n)))))) \Leftrightarrow True) \wedge (((p (ap (ap c_2Integer_2Eint_lt \\
& \quad (ap c_2Integer_2Eint_of_num c_2Enum_2E0)) (ap c_2Integer_2Eint_of_num \\
& \quad (ap c_2Arithmetic_2ENUMERAL (ap c_2Arithmetic_2EBIT2 V0n)))))) \Leftrightarrow \\
& \quad True) \wedge (((p (ap (ap c_2Integer_2Eint_lt (ap c_2Integer_2Eint_of_num \\
& \quad c_2Enum_2E0)) (ap c_2Integer_2Eint_of_num c_2Enum_2E0))) \Leftrightarrow \\
& \quad False) \wedge (((p (ap (ap c_2Integer_2Eint_lt (ap c_2Integer_2Eint_of_num \\
& \quad c_2Enum_2E0)) (ap c_2Integer_2Eint_neg (ap c_2Integer_2Eint_of_num \\
& \quad (ap c_2Arithmetic_2ENUMERAL V0n)))))) \Leftrightarrow False) \wedge (((p (ap (ap c_2Integer_2Eint_lt \\
& \quad (ap c_2Integer_2Eint_of_num (ap c_2Arithmetic_2ENUMERAL \\
& \quad V0n)) (ap c_2Integer_2Eint_of_num c_2Enum_2E0))) \Leftrightarrow False) \wedge \\
& \quad (((p (ap (ap c_2Integer_2Eint_lt (ap c_2Integer_2Eint_neg \\
& \quad (ap c_2Integer_2Eint_of_num (ap c_2Arithmetic_2ENUMERAL \\
& \quad (ap c_2Arithmetic_2EBIT1 V0n)))))) (ap c_2Integer_2Eint_of_num \\
& \quad c_2Enum_2E0))) \Leftrightarrow True) \wedge (((p (ap (ap c_2Integer_2Eint_lt (ap \\
& \quad c_2Integer_2Eint_neg (ap c_2Integer_2Eint_of_num (ap c_2Arithmetic_2ENUMERAL \\
& \quad (ap c_2Arithmetic_2EBIT2 V0n)))))) (ap c_2Integer_2Eint_of_num \\
& \quad c_2Enum_2E0))) \Leftrightarrow True) \wedge (((p (ap (ap c_2Integer_2Eint_lt (ap \\
& \quad c_2Integer_2Eint_of_num (ap c_2Arithmetic_2ENUMERAL V0n))) \\
& \quad (ap c_2Integer_2Eint_of_num (ap c_2Arithmetic_2ENUMERAL \\
& \quad V1m)))))) \Leftrightarrow (p (ap (ap c_2Eprim_rec_2E_3C V0n V1m))) \wedge (((p (ap (ap \\
& \quad c_2Integer_2Eint_lt (ap c_2Integer_2Eint_neg (ap c_2Integer_2Eint_of_num \\
& \quad (ap c_2Arithmetic_2ENUMERAL (ap c_2Arithmetic_2EBIT1 V0n)))))) \\
& \quad (ap c_2Integer_2Eint_of_num (ap c_2Arithmetic_2ENUMERAL \\
& \quad V1m)))))) \Leftrightarrow True) \wedge (((p (ap (ap c_2Integer_2Eint_lt (ap c_2Integer_2Eint_neg \\
& \quad (ap c_2Integer_2Eint_of_num (ap c_2Arithmetic_2ENUMERAL \\
& \quad (ap c_2Arithmetic_2EBIT2 V0n)))))) (ap c_2Integer_2Eint_of_num \\
& \quad (ap c_2Arithmetic_2ENUMERAL V1m)))))) \Leftrightarrow True) \wedge (((p (ap (ap c_2Integer_2Eint_lt \\
& \quad (ap c_2Integer_2Eint_of_num (ap c_2Arithmetic_2ENUMERAL \\
& \quad V0n)) (ap c_2Integer_2Eint_neg (ap c_2Integer_2Eint_of_num \\
& \quad (ap c_2Arithmetic_2ENUMERAL V1m)))))) \Leftrightarrow False) \wedge (((p (ap (ap c_2Integer_2Eint_lt \\
& \quad (ap c_2Integer_2Eint_neg (ap c_2Integer_2Eint_of_num (\\
& \quad ap c_2Arithmetic_2ENUMERAL V0n)))) (ap c_2Integer_2Eint_neg \\
& \quad (ap c_2Integer_2Eint_of_num (ap c_2Arithmetic_2ENUMERAL \\
& \quad V1m)))))) \Leftrightarrow (p (ap (ap c_2Eprim_rec_2E_3C V1m) V0n))))))))))))) \\
& \hspace{15em} (45)
\end{aligned}$$

Assume the following.

$$(\forall V0t \in 2. ((\neg(\neg(p V0t))) \Leftrightarrow (p V0t))) \quad (46)$$

Assume the following.

$$(\forall V0A \in 2. ((p V0A) \Rightarrow ((\neg(p V0A)) \Rightarrow False))) \quad (47)$$

Assume the following.

$$(\forall V0A \in 2. (\forall V1B \in 2. (((\neg((p V0A) \vee (p V1B))) \Rightarrow False) \Leftrightarrow ((p V0A) \Rightarrow False) \Rightarrow ((\neg(p V1B)) \Rightarrow False)))) \quad (48)$$

Assume the following.

$$(\forall V0A \in 2. (\forall V1B \in 2. (((\neg(\neg(p V0A)) \vee (p V1B))) \Rightarrow False) \Leftrightarrow ((p V0A) \Rightarrow ((\neg(p V1B)) \Rightarrow False)))) \quad (49)$$

Assume the following.

$$(\forall V0A \in 2. (((\neg(p V0A)) \Rightarrow False) \Rightarrow ((p V0A) \Rightarrow False) \Rightarrow False)) \quad (50)$$

Assume the following.

$$(\forall V0p \in 2. (\forall V1q \in 2. (\forall V2r \in 2. (((p V0p) \Leftrightarrow (p V1q) \Leftrightarrow (p V2r)) \Leftrightarrow (((p V0p) \vee ((p V1q) \vee (p V2r))) \wedge (((p V0p) \vee (\neg(p V2r)) \vee (\neg(p V1q)))) \wedge (((p V1q) \vee ((\neg(p V2r)) \vee (\neg(p V0p)))) \wedge ((p V2r) \vee ((\neg(p V1q)) \vee (\neg(p V0p)))))))))) \quad (51)$$

Assume the following.

$$(\forall V0p \in 2. (\forall V1q \in 2. (\forall V2r \in 2. (((p V0p) \Leftrightarrow (p V1q) \wedge (p V2r)) \Leftrightarrow (((p V0p) \vee ((\neg(p V1q)) \vee (\neg(p V2r)))) \wedge (((p V1q) \vee (\neg(p V0p))) \wedge ((p V2r) \vee (\neg(p V0p)))))))) \quad (52)$$

Assume the following.

$$(\forall V0p \in 2. (\forall V1q \in 2. (\forall V2r \in 2. (((p V0p) \Leftrightarrow (p V1q) \vee (p V2r)) \Leftrightarrow (((p V0p) \vee (\neg(p V1q))) \wedge (((p V0p) \vee (\neg(p V2r))) \wedge ((p V1q) \vee ((p V2r) \vee (\neg(p V0p)))))))) \quad (53)$$

Assume the following.

$$(\forall V0p \in 2. (\forall V1q \in 2. (((p V0p) \Leftrightarrow (\neg(p V1q))) \Leftrightarrow ((p V0p) \vee (p V1q)) \wedge ((\neg(p V1q)) \vee (\neg(p V0p)))))) \quad (54)$$

Theorem 1

$$(\forall V0x \in ty_2Einteger_2Eint. (\forall V1y \in ty_2Einteger_2Eint. ((p (ap (ap c_2Einteger_2Eint_le (ap (ap c_2Einteger_2Eint_add (ap (ap c_2Einteger_2Eint_mul (ap c_2Einteger_2Eint_neg (ap c_2Einteger_2Eint_of_num (ap c_2Earithmetic_2ENUMERAL (ap c_2Earithmetic_2EBIT1 c_2Earithmetic_2EZERO)))))) V0x)) V1y)) (ap c_2Einteger_2Eint_of_num c_2Enum_2E0)) \Leftrightarrow (p (ap (ap c_2Einteger_2Eint_ge (ap (ap c_2Einteger_2Eint_add V0x) (ap (ap c_2Einteger_2Eint_mul (ap c_2Einteger_2Eint_neg (ap c_2Einteger_2Eint_of_num (ap c_2Earithmetic_2ENUMERAL (ap c_2Earithmetic_2EBIT1 c_2Earithmetic_2EZERO)))))) V1y)) (ap c_2Einteger_2Eint_of_num c_2Enum_2E0))))))$$