

thm_2Erich__list_2EREPLICATE__compute
(TMNFscfrZDXFsTPGhRP8h9GndzrzAZ2fEE4)

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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 1 We define c_2Emin_2E3D 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_2Enum_2E0 to be $(ap\ c_2Enum_2EABS_num\ c_2Enum_2EZERO_REP)$.

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 3 We define c_2Ebool_2ET to be $(ap\ (ap\ (c_2Emin_2E3D\ (2^2))\ (\lambda V0x \in 2.V0x))\ (\lambda V1x \in 2.V1x))$

Definition 4 We define c_2Ebool_2E21 to be $\lambda A.\lambda a : \iota.(\lambda V0P \in (2^{A-27a}).(ap\ (ap\ (c_2Emin_2E3D\ (2^{A-27a}))\ (\lambda V1x \in 2.V1x))\ (\lambda V1x \in 2.V1x))$

Definition 5 We define c_2Enum_2ESUC to be $\lambda V0m \in ty_2Enum_2Enum.(ap\ c_2Enum_2EABS_num\ (c_2Enum_2ESUC_REP\ m))$

Let $c_2Earithmetic_2E2B : \iota$ be given. Assume the following.

$$c_2Earithmetic_2E2B \in ((ty_2Enum_2Enum^{ty_2Enum_2Enum})^{ty_2Enum_2Enum}) \tag{6}$$

Definition 6 We define $c_2Earithmetic_2EBIT2$ to be $\lambda V0n \in ty_2Enum_2Enum.(ap (ap c_2Earithmetic_2E_2D$

Definition 7 We define $c_2Earithmetic_2EZERO$ to be c_2Enum_2E0 .

Let $c_2Earithmetic_2E_2D : \iota$ be given. Assume the following.

$$c_2Earithmetic_2E_2D \in ((ty_2Enum_2Enum^{ty_2Enum_2Enum})^{ty_2Enum_2Enum}) \quad (7)$$

Definition 8 We define $c_2Earithmetic_2EBIT1$ to be $\lambda V0n \in ty_2Enum_2Enum.(ap (ap c_2Earithmetic_2E_2D$

Definition 9 We define $c_2Earithmetic_2ENUMERAL$ to be $\lambda V0x \in ty_2Enum_2Enum.V0x$.

Definition 10 We define $c_2Emin_2E_3D_3D_3E$ to be $\lambda P \in 2.\lambda Q \in 2.inj_o (p P \Rightarrow p Q)$ of type ι .

Let $ty_2Elist_2Elist : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty A0 \Rightarrow nonempty (ty_2Elist_2Elist A0) \quad (8)$$

Let $c_2Elist_2ECONS : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty A_27a \Rightarrow c_2Elist_2ECONS A_27a \in (((ty_2Elist_2Elist A_27a)^{(ty_2Elist_2Elist A_27a)})^{A_27a}) \quad (9)$$

Let $c_2Elist_2ENIL : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty A_27a \Rightarrow c_2Elist_2ENIL A_27a \in (ty_2Elist_2Elist A_27a) \quad (10)$$

Let $c_2Erich_list_2EREPLICATE : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty A_27a \Rightarrow c_2Erich_list_2EREPLICATE A_27a \in (((ty_2Elist_2Elist A_27a)^{A_27a})^{ty_2Enum_2Enum}) \quad (11)$$

Definition 11 We define $c_2Ebool_2E_2F_5C$ to be $(\lambda V0t1 \in 2.(\lambda V1t2 \in 2.(ap (c_2Ebool_2E_21 2) (\lambda V2t \in 2.$

Assume the following.

$$\begin{aligned} & \forall A_27a.nonempty A_27a \Rightarrow (\forall V0f \in ((A_27a)^{ty_2Enum_2Enum})^{ty_2Enum_2Enum}). \\ & \quad (\forall V1g \in (A_27a)^{ty_2Enum_2Enum}). ((\forall V2n \in ty_2Enum_2Enum. \\ & \quad ((ap V1g (ap c_2Enum_2ESUC V2n)) = (ap (ap V0f V2n) (ap c_2Enum_2ESUC V2n)))) \Leftrightarrow ((\forall V3n \in ty_2Enum_2Enum. ((ap V1g (ap c_2Earithmetic_2ENUMERAL \\ & \quad (ap c_2Earithmetic_2EBIT1 V3n))) = (ap (ap V0f (ap (ap c_2Earithmetic_2E_2D \\ & \quad (ap c_2Earithmetic_2ENUMERAL (ap c_2Earithmetic_2EBIT1 V3n))) \\ & \quad (ap c_2Earithmetic_2ENUMERAL (ap c_2Earithmetic_2EBIT1 c_2Earithmetic_2EZERO)))))) \\ & \quad (ap c_2Earithmetic_2ENUMERAL (ap c_2Earithmetic_2EBIT1 V3n)))))) \wedge \\ & \quad (\forall V4n \in ty_2Enum_2Enum. ((ap V1g (ap c_2Earithmetic_2ENUMERAL \\ & \quad (ap c_2Earithmetic_2EBIT2 V4n))) = (ap (ap V0f (ap c_2Earithmetic_2ENUMERAL \\ & \quad (ap c_2Earithmetic_2EBIT1 V4n))) (ap c_2Earithmetic_2ENUMERAL \\ & \quad (ap c_2Earithmetic_2EBIT2 V4n))))))))) \quad (12) \end{aligned}$$

Assume the following.

$$(\forall V0t1 \in 2. (\forall V1t2 \in 2. (((p V0t1) \Rightarrow (p V1t2)) \Rightarrow (((p V1t2) \Rightarrow (p V0t1)) \Rightarrow ((p V0t1) \Leftrightarrow (p V1t2)))))) \quad (13)$$

Assume the following.

$$\begin{aligned} \forall A_27a. \text{nonempty } A_27a \Rightarrow & ((\forall V0x \in A_27a. ((\text{ap } (\text{ap } (c_2Erich_list_2EREPLICATE \\ & A_27a) \text{ c_2Enum_2E0}) V0x) = (c_2Elist_2ENIL A_27a))) \wedge (\forall V1n \in \\ & ty_2Enum_2Enum. (\forall V2x \in A_27a. ((\text{ap } (\text{ap } (c_2Erich_list_2EREPLICATE \\ & A_27a) (\text{ap } c_2Enum_2ESUC V1n)) V2x) = (\text{ap } (\text{ap } (c_2Elist_2ECONS A_27a) \\ & V2x) (\text{ap } (\text{ap } (c_2Erich_list_2EREPLICATE A_27a) V1n) V2x)))))) \quad (14) \end{aligned}$$

Theorem 1

$$\begin{aligned} \forall A_27a. \text{nonempty } A_27a \Rightarrow & ((\forall V0x \in A_27a. ((\text{ap } (\text{ap } (c_2Erich_list_2EREPLICATE \\ & A_27a) \text{ c_2Enum_2E0}) V0x) = (c_2Elist_2ENIL A_27a))) \wedge ((\forall V1n \in \\ & ty_2Enum_2Enum. (\forall V2x \in A_27a. ((\text{ap } (\text{ap } (c_2Erich_list_2EREPLICATE \\ & A_27a) (\text{ap } c_2Earithmetic_2ENUMERAL (\text{ap } c_2Earithmetic_2EBIT1 \\ & V1n))) V2x) = (\text{ap } (\text{ap } (c_2Elist_2ECONS A_27a) V2x) (\text{ap } (\text{ap } (c_2Erich_list_2EREPLICATE \\ & A_27a) (\text{ap } (\text{ap } c_2Earithmetic_2E_2D (\text{ap } c_2Earithmetic_2ENUMERAL \\ & (\text{ap } c_2Earithmetic_2EBIT1 V1n))) (\text{ap } c_2Earithmetic_2ENUMERAL \\ & (\text{ap } c_2Earithmetic_2EBIT1 c_2Earithmetic_2EZERO)))))) V2x)))))) \wedge \\ & (\forall V3n \in ty_2Enum_2Enum. (\forall V4x \in A_27a. ((\text{ap } (\text{ap } (c_2Erich_list_2EREPLICATE \\ & A_27a) (\text{ap } c_2Earithmetic_2ENUMERAL (\text{ap } c_2Earithmetic_2EBIT2 \\ & V3n))) V4x) = (\text{ap } (\text{ap } (c_2Elist_2ECONS A_27a) V4x) (\text{ap } (\text{ap } (c_2Erich_list_2EREPLICATE \\ & A_27a) (\text{ap } c_2Earithmetic_2ENUMERAL (\text{ap } c_2Earithmetic_2EBIT1 \\ & V3n))) V4x)))))) \end{aligned}$$