thm_2Equotient__pair_2ECURRY__RSP (TMco4xvJqrcC84aRJZr6cf5YcaeJEUZLJYC)

October 26, 2020

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_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.

Definition 3 *We define* c_2Ebool_2ET *to be* $(ap\ (ap\ (\text{c\_2Emin\_2E\_3D}\ (2^2))\ (\lambda V0x \in 2.V0x))\ (\lambda V1x \in 2.V1$

Definition 4 *We define* c_2Ebool_2E_21 *to be* $\lambda A\_27a : \iota.(\lambda V0P \in (2^{A\_27a}).(ap\ (ap\ (\text{c\_2Emin\_2E\_3D}\ (2^{A\_27}$

Definition 5 *We define* c_2Ebool_2E_2F_5C *to be* $(\lambda V0t1 \in 2.(\lambda V1t2 \in 2.(ap\ (\text{c\_2Ebool\_2E\_21}\ 2)\ (\lambda V2t \in 2$

Definition 6 *We define* c_2Equotient_2EQUOTIENT *to be* $\lambda A\_27a : \iota.\lambda A\_27b : \iota.\lambda V0R \in ((2^{A\_27a})^{A\_27a}).\lambda$

Let $ty\_2Epair\_2Eprod : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow \forall A1.nonempty\ A1 \Rightarrow nonempty\ (ty\_2Epair\_2Eprod\ A0\ A1) \tag{1}$$

Let $c\_2Epair\_2EABS\_\_prod : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow \forall A\_27b.nonempty\ A\_27b \Rightarrow c\_2Epair\_2EABS\_\_prod\ A\_27a\ A\_27b \in ((ty\_2Epair\_2Eprod\ A\_27a\ A\_27b)^{((2^{A\_27b})^{A\_27a})}) \tag{2}$$

Definition 7 *We define* c_2Epair_2E_2C *to be* $\lambda A\_27a : \iota.\lambda A\_27b : \iota.\lambda V0x \in A\_27a.\lambda V1y \in A\_27b.(ap\ (c\_2E$

Definition 8 *We define* c_2Epair_2ECURRY *to be* $\lambda A\_27a : \iota.\lambda A\_27b : \iota.\lambda A\_27c : \iota.\lambda V0f \in (A\_27c^{(ty\_2Epair}$

Definition 9 *We define* c_2Equotient_2E_3D_3D_3D_3E *to be* $\lambda A\_27a : \iota.\lambda A\_27b : \iota.\lambda V0R1 \in ((2^{A\_27a})^{A\_27a}$

Let $c\_2Epair\_2ESND : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow \forall A\_27b.nonempty\ A\_27b \Rightarrow c\_2Epair\_2ESND\ A\_27a\ A\_27b \in (A\_27b^{(ty\_2Epair\_2Eprod\ A\_27a\ A\_27b)}) \tag{3}$$

Let $c\_2Epair\_2EFST : \iota{\Rightarrow}\iota{\Rightarrow}\iota$ be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a{\Rightarrow}\forall A\_27b.nonempty\ A\_27b{\Rightarrow}c\_2Epair\_2EFST\ A\_27a\ A\_27b \in (A\_27a^{(ty\_2Epair\_2Eprod\ A\_27a\ A\_27b)}) \quad (4)$$

Definition 10 *We define* $\mathsf{c\_2Epair\_2EUNCURRY}$ *to be* $\lambda A\_27a : \iota.\lambda A\_27b : \iota.\lambda A\_27c : \iota.\lambda V0f \in ((A\_27c^{A\_27}$

Definition 11 *We define* $\mathsf{c\_2Equotient\_\_pair\_2E\_23\_23\_23}$ *to be* $\lambda A\_27a : \iota.\lambda A\_27b : \iota.\lambda A\_27c : \iota.\lambda A\_27d : \iota.\lambda$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a{\Rightarrow}\forall A\_27b.nonempty\ A\_27b{\Rightarrow}\forall A\_27c.nonempty\ A\_27c{\Rightarrow}\forall A\_27d.nonempty\ A\_27d{\Rightarrow}(\forall V0R1 \in ((2^{A\_27c})^{A\_27a}).(\forall V1R2 \in ((2^{A\_27d})^{A\_27b}).(\forall V2a \in A\_27a.(\forall V3b \in A\_27b.(\forall V4c \in A\_27c.(\forall V5d \in A\_27d.((p\ (ap\ (ap\ (ap\ (ap\ (\mathsf{c\_2Equotient\_\_pair\_2E\_23\_23\_23}\ A\_27a\ A\_27b\ A\_27c\ A\_27d)\ V0R1)\ V1R2)\ (ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}\ A\_27a\ A\_27b)\ V2a)\ V3b))\ (ap\ (ap\ (\mathsf{c\_2Epair\_2E\_2C}\ A\_27c\ A\_27d)\ V4c)\ V5d))){\Leftrightarrow}((p\ (ap\ (ap\ V0R1\ V2a)\ V4c)){\wedge}(p\ (ap\ (ap\ V1R2\ V3b)\ V5d))))))))) \quad (5)$$

Theorem 1

$$\forall A\_27a.nonempty\ A\_27a{\Rightarrow}\forall A\_27b.nonempty\ A\_27b{\Rightarrow}\forall A\_27c.nonempty\ A\_27c{\Rightarrow}\forall A\_27d.nonempty\ A\_27d{\Rightarrow}\forall A\_27e.nonempty\ A\_27e{\Rightarrow}\forall A\_27f.nonempty\ A\_27f{\Rightarrow}(\forall V0R1 \in ((2^{A\_27a})^{A\_27a}).(\forall V1abs1 \in (A\_27d^{A\_27a}).(\forall V2rep1 \in (A\_27a^{A\_27d}).((p\ (ap\ (ap\ (ap\ (\mathsf{c\_2Equotient\_2EQUOTIENT}\ A\_27a\ A\_27d)\ V0R1)\ V1abs1)\ V2rep1)){\Rightarrow}(\forall V3R2 \in ((2^{A\_27b})^{A\_27b}).(\forall V4abs2 \in (A\_27e^{A\_27b}).(\forall V5rep2 \in (A\_27b^{A\_27e}).((p\ (ap\ (ap\ (ap\ (\mathsf{c\_2Equotient\_2EQUOTIENT}\ A\_27b\ A\_27e)\ V3R2)\ V4abs2)\ V5rep2)){\Rightarrow}(\forall V6R3 \in ((2^{A\_27c})^{A\_27c}).(\forall V7abs3 \in (A\_27f^{A\_27c}).(\forall V8rep3 \in (A\_27c^{A\_27f}).((p\ (ap\ (ap\ (ap\ (\mathsf{c\_2Equotient\_2EQUOTIENT}\ A\_27c\ A\_27f)\ V6R3)\ V7abs3)\ V8rep3)){\Rightarrow}(\forall V9f1 \in (A\_27c^{(ty\_2Epair\_2Eprod\ A\_27a\ A\_27b)}).(\forall V10f2 \in (A\_27c^{(ty\_2Epair\_2Eprod\ A\_27a\ A\_27b)}).((p\ (ap\ (ap\ (ap\ (ap\ (\mathsf{c\_2Equotient\_2E\_3D\_3D\_3D\_3E}\ (ty\_2Epair\_2Eprod\ A\_27a\ A\_27b)\ A\_27c)\ (ap\ (ap\ (\mathsf{c\_2Equotient\_\_pair\_2E\_23\_23\_23}\ A\_27a\ A\_27b\ A\_27a\ A\_27b)\ V0R1)\ V3R2))\ V6R3)\ V9f1)\ V10f2)){\Rightarrow}(p\ (ap\ (ap\ (ap\ (ap\ (\mathsf{c\_2Equotient\_2E\_3D\_3D\_3D\_3E}\ A\_27a\ (A\_27c^{A\_27b}))\ V0R1)\ (ap\ (ap\ (\mathsf{c\_2Equotient\_2E\_3D\_3D\_3D\_3E}\ A\_27b\ A\_27c)\ V3R2)\ V6R3))\ (ap\ (\mathsf{c\_2Epair\_2ECURRY}\ A\_27a\ A\_27b\ A\_27c)\ V9f1))\ (ap\ (\mathsf{c\_2Epair\_2ECURRY}\ A\_27a\ A\_27b\ A\_27c)\ V10f2))))))))))))))))))$$