

thm_2EquantHeuristics_2EGUESSES_NEG_REWRITE (TMNjN94KkG4LiLSuwxgKhvgSGfak53q64S9)

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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_2ET 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 $\lambda A_27a : \iota.(\lambda V0P \in (2^{A-27a}).(ap (ap (c_2Emin_2E_3D (2^{A-27a}))$

Definition 4 We define c_2Ebool_2EF 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 $\lambda P \in 2.\lambda Q \in 2.inj_o (p P \Rightarrow p Q)$
of type ι .

Definition 6 We define $c_2Ebool_2E_7E$ to be $(\lambda V0t \in 2.(ap (ap c_2Emin_2E_3D_3D_3E V0t) c_2Ebool_2EF$

Definition 7 We define $c_2EquantHeuristics_2EGUESS_FORALL_POINT$ to be
 $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda V0i \in (A_27b^{A-27a}).\lambda V1P \in (2^{A-27b}).(ap (c_2Ebool_2E_21 A_27a) (\lambda V2fv \in A_27a.$

Definition 8 We define $c_2EquantHeuristics_2EGUESS_EXISTS_POINT$ to be
 $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda V0i \in (A_27b^{A-27a}).\lambda V1P \in (2^{A-27b}).(ap (c_2Ebool_2E_21 A_27a) (\lambda V2fv \in A_27a.$

Definition 9 We define $c_2Emin_2E_40$ to be $\lambda A.\lambda P \in 2^A.if (\exists x \in A.p (ap P x)) \text{ then } (the (\lambda x.x \in A \wedge p$
of type $\iota \Rightarrow \iota$.

Definition 10 We define $c_2Ebool_2E_3F$ to be $\lambda A_27a : \iota.(\lambda V0P \in (2^{A-27a}).(ap V0P (ap (c_2Emin_2E_40$

Definition 11 We define $c_2EquantHeuristics_2EGUESS_FORALL_GAP$ to be
 $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda V0i \in (A_27b^{A-27a}).\lambda V1P \in (2^{A-27b}).(ap (c_2Ebool_2E_21 A_27b) (\lambda V2v \in A_27b.(a$

Definition 12 We define $c_2EquantHeuristics_2EGUESS_EXISTS_GAP$ to be
 $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda V0i \in (A_27b^{A-27a}).\lambda V1P \in (2^{A-27b}).(ap (c_2Ebool_2E_21 A_27b) (\lambda V2v \in A_27b.(a$

Definition 13 We define $c_2EquantHeuristics_2EGUESS_FORALL$ to be $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda V0i \in (A_27b^{A-27a}).$

Definition 14 We define $c_2Ecombin_2Eo$ to be $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda A_27c : \iota.\lambda V0f \in (A_27b^{A-27c}).\lambda V1,$

Definition 15 We define $c_2\text{EquantHeuristics_2EGUESS_EXISTS}$ to be $\lambda A_27a : \iota. \lambda A_27b : \iota. \lambda V0i \in (A_27b$

Definition 16 We define $c_2\text{Ebool_2E_2F_5C}$ to be $(\lambda V0t1 \in 2. (\lambda V1t2 \in 2. (ap (c_2\text{Ebool_2E_21 } 2) (\lambda V2t \in$

Assume the following.

$$\begin{aligned}
& \forall A_27a. \text{nonempty } A_27a \Rightarrow \forall A_27b. \text{nonempty } A_27b \Rightarrow (\\
& \quad \forall V0i \in (A_27b^{A_27a}). (\forall V1P \in (2^{A_27b}). (((p (ap (ap \\
& \quad (c_2\text{EquantHeuristics_2EGUESS_EXISTS } A_27a \ A_27b) V0i) (ap (\\
& \quad ap (c_2\text{Ecombin_2Eo } A_27b \ 2 \ 2) c_2\text{Ebool_2E_7E) V1P))) \Leftrightarrow (p (ap (\\
& \quad ap (c_2\text{EquantHeuristics_2EGUESS_FORALL } A_27a \ A_27b) V0i) V1P))) \wedge \\
& \quad (((p (ap (ap (c_2\text{EquantHeuristics_2EGUESS_FORALL } A_27a \ A_27b) \\
& \quad V0i) (ap (ap (c_2\text{Ecombin_2Eo } A_27b \ 2 \ 2) c_2\text{Ebool_2E_7E) V1P))) \Leftrightarrow \\
& \quad (p (ap (ap (c_2\text{EquantHeuristics_2EGUESS_EXISTS } A_27a \ A_27b) \\
& \quad V0i) V1P))) \wedge (((p (ap (ap (c_2\text{EquantHeuristics_2EGUESS_EXISTS_GAP} \\
& \quad A_27a \ A_27b) V0i) (ap (ap (c_2\text{Ecombin_2Eo } A_27b \ 2 \ 2) c_2\text{Ebool_2E_7E) \\
& \quad V1P))) \Leftrightarrow (p (ap (ap (c_2\text{EquantHeuristics_2EGUESS_FORALL_GAP} \\
& \quad A_27a \ A_27b) V0i) V1P))) \wedge (((p (ap (ap (c_2\text{EquantHeuristics_2EGUESS_FORALL_GAP} \\
& \quad A_27a \ A_27b) V0i) (ap (ap (c_2\text{Ecombin_2Eo } A_27b \ 2 \ 2) c_2\text{Ebool_2E_7E) \\
& \quad V1P))) \Leftrightarrow (p (ap (ap (c_2\text{EquantHeuristics_2EGUESS_EXISTS_GAP} \\
& \quad A_27a \ A_27b) V0i) V1P))) \wedge (((p (ap (ap (c_2\text{EquantHeuristics_2EGUESS_EXISTS_POINT} \\
& \quad A_27a \ A_27b) V0i) (ap (ap (c_2\text{Ecombin_2Eo } A_27b \ 2 \ 2) c_2\text{Ebool_2E_7E) \\
& \quad V1P))) \Leftrightarrow (p (ap (ap (c_2\text{EquantHeuristics_2EGUESS_FORALL_POINT} \\
& \quad A_27a \ A_27b) V0i) V1P))) \wedge (((p (ap (ap (c_2\text{EquantHeuristics_2EGUESS_FORALL_POINT} \\
& \quad A_27a \ A_27b) V0i) (ap (ap (c_2\text{Ecombin_2Eo } A_27b \ 2 \ 2) c_2\text{Ebool_2E_7E) \\
& \quad V1P))) \Leftrightarrow (p (ap (ap (c_2\text{EquantHeuristics_2EGUESS_EXISTS_POINT} \\
& \quad A_27a \ A_27b) V0i) V1P))))))))))
\end{aligned} \tag{1}$$

Theorem 1

$$\begin{aligned}
& \forall A_{.27a}.nonempty\ A_{.27a} \Rightarrow \forall A_{.27b}.nonempty\ A_{.27b} \Rightarrow (\\
& \quad \forall V0i \in (A_{.27b}^{A_{.27a}}). (\forall V1P \in (2^{A_{.27b}}). (((p\ (ap\ (ap \\
& \quad (c_2EquantHeuristics_2EGUESS_EXISTS\ A_{.27a}\ A_{.27b})\ V0i)\ (\lambda V2x \in \\
& \quad A_{.27b}.(ap\ c_2Ebool_2E_7E\ (ap\ V1P\ V2x)))))) \Leftrightarrow (p\ (ap\ (ap\ (c_2EquantHeuristics_2EGUESS_FORALL \\
& \quad A_{.27a}\ A_{.27b})\ V0i)\ (\lambda V3x \in A_{.27b}.(ap\ V1P\ V3x)))))) \wedge (((p\ (ap\ (ap \\
& \quad (c_2EquantHeuristics_2EGUESS_FORALL\ A_{.27a}\ A_{.27b})\ V0i)\ (\lambda V4x \in \\
& \quad A_{.27b}.(ap\ c_2Ebool_2E_7E\ (ap\ V1P\ V4x)))))) \Leftrightarrow (p\ (ap\ (ap\ (c_2EquantHeuristics_2EGUESS_EXISTS \\
& \quad A_{.27a}\ A_{.27b})\ V0i)\ (\lambda V5x \in A_{.27b}.(ap\ V1P\ V5x)))))) \wedge (((p\ (ap\ (ap \\
& \quad (c_2EquantHeuristics_2EGUESS_EXISTS_GAP\ A_{.27a}\ A_{.27b})\ V0i) \\
& \quad (\lambda V6x \in A_{.27b}.(ap\ c_2Ebool_2E_7E\ (ap\ V1P\ V6x)))))) \Leftrightarrow (p\ (ap\ (ap \\
& \quad (c_2EquantHeuristics_2EGUESS_FORALL_GAP\ A_{.27a}\ A_{.27b})\ V0i) \\
& \quad (\lambda V7x \in A_{.27b}.(ap\ V1P\ V7x)))))) \wedge (((p\ (ap\ (ap\ (c_2EquantHeuristics_2EGUESS_FORALL_GAP \\
& \quad A_{.27a}\ A_{.27b})\ V0i)\ (\lambda V8x \in A_{.27b}.(ap\ c_2Ebool_2E_7E\ (ap\ V1P\ V8x)))))) \Leftrightarrow \\
& \quad (p\ (ap\ (ap\ (c_2EquantHeuristics_2EGUESS_EXISTS_GAP\ A_{.27a}\ A_{.27b}) \\
& \quad V0i)\ (\lambda V9x \in A_{.27b}.(ap\ V1P\ V9x)))))) \wedge (((p\ (ap\ (ap\ (c_2EquantHeuristics_2EGUESS_EXISTS_POIN \\
& \quad A_{.27a}\ A_{.27b})\ V0i)\ (\lambda V10x \in A_{.27b}.(ap\ c_2Ebool_2E_7E\ (ap\ V1P\ V10x)))))) \Leftrightarrow \\
& \quad (p\ (ap\ (ap\ (c_2EquantHeuristics_2EGUESS_FORALL_POINT\ A_{.27a} \\
& \quad A_{.27b})\ V0i)\ (\lambda V11x \in A_{.27b}.(ap\ V1P\ V11x)))))) \wedge (((p\ (ap\ (ap\ (c_2EquantHeuristics_2EGUESS_FORALL \\
& \quad A_{.27a}\ A_{.27b})\ V0i)\ (\lambda V12x \in A_{.27b}.(ap\ c_2Ebool_2E_7E\ (ap\ V1P\ V12x)))))) \Leftrightarrow \\
& \quad (p\ (ap\ (ap\ (c_2EquantHeuristics_2EGUESS_EXISTS_POINT\ A_{.27a} \\
& \quad A_{.27b})\ V0i)\ (\lambda V13x \in A_{.27b}.(ap\ V1P\ V13x)))))))))
\end{aligned}$$