



**Definition 8** We define  $c\_2Epair\_2E\_2C$  to be  $\lambda A\_27a : \iota.\lambda A\_27b : \iota.\lambda V0x \in A\_27a.\lambda V1y \in A\_27b.(ap (c\_2E$

Assume the following.

$$True \tag{5}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow (\forall V0t \in 2.((\forall V1x \in A\_27a.(p\ V0t)) \Leftrightarrow (p\ V0t))) \tag{6}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow (\forall V0x \in A\_27a.((V0x = V0x) \Leftrightarrow True)) \tag{7}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow \forall A\_27b.nonempty\ A\_27b \Rightarrow (\forall V0f \in (A\_27b^{A\_27a}).(\forall V1g \in (A\_27b^{A\_27a}).((V0f = V1g) \Leftrightarrow (\forall V2x \in A\_27a.((ap\ V0f\ V2x) = (ap\ V1g\ V2x)))))) \tag{8}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow \forall A\_27b.nonempty\ A\_27b \Rightarrow (\forall V0x \in A\_27a.(\forall V1y \in A\_27b.((ap (c\_2Epair\_2EFST\ A\_27a\ A\_27b) (ap (ap (c\_2Epair\_2E\_2C\ A\_27a\ A\_27b) V0x) V1y)) = V0x))) \tag{9}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow \forall A\_27b.nonempty\ A\_27b \Rightarrow (\forall V0x \in A\_27a.(\forall V1y \in A\_27b.((ap (c\_2Epair\_2ESND\ A\_27a\ A\_27b) (ap (ap (c\_2Epair\_2E\_2C\ A\_27a\ A\_27b) V0x) V1y)) = V1y))) \tag{10}$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow \forall A\_27b.nonempty\ A\_27b \Rightarrow (\forall V0P \in (2^{(ty\_2Epair\_2Eprod\ A\_27a\ A\_27b)}).((\forall V1p \in (ty\_2Epair\_2Eprod\ A\_27a\ A\_27b).(p (ap\ V0P\ V1p))) \Leftrightarrow (\forall V2p\_1 \in A\_27a.(\forall V3p\_2 \in A\_27b.(p (ap\ V0P (ap (ap (c\_2Epair\_2E\_2C\ A\_27a\ A\_27b) V2p\_1) V3p\_2)))))))) \tag{11}$$

**Theorem 1**

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow \forall A\_27b.nonempty\ A\_27b \Rightarrow (\forall V0f \in ((2^{A\_27b})^{A\_27a}).((p (ap (c\_2Ebool\_2E\_21 (ty\_2Epair\_2Eprod\ A\_27a\ A\_27b)) (ap (c\_2Epair\_2EUNCURRY\ A\_27a\ A\_27b\ 2) V0f))) \Leftrightarrow (p (ap (c\_2Ebool\_2E\_21\ A\_27a) (ap (ap (c\_2Ecombin\_2Eo\ A\_27a\ 2 (2^{A\_27b})) (c\_2Ebool\_2E\_21\ A\_27b)) V0f))))))$$