

## t30\_cat\_4

(TMFMV2R3mama4jTix9y7b461raK81gWn14R)

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Let  $v2\_struct\_0 : \iota \Rightarrow o$  be given. Let  $v11\_struct\_0 : \iota \Rightarrow o$  be given. Let  $v2\_cat\_1 : \iota \Rightarrow o$  be given. Let  $v3\_cat\_1 : \iota \Rightarrow o$  be given. Let  $v4\_cat\_1 : \iota \Rightarrow o$  be given. Let  $v5\_cat\_1 : \iota \Rightarrow o$  be given. Let  $v6\_cat\_1 : \iota \Rightarrow o$  be given. Let  $v3\_cat\_4 : \iota \Rightarrow o$  be given. Let  $l1\_cat\_4 : \iota \Rightarrow o$  be given. Let  $m1\_subset\_1 : \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $u1\_struct\_0 : \iota \Rightarrow \iota$  be given. Let  $r1\_cat\_1 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $k2\_cat\_4 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k1\_cat\_4 : \iota \Rightarrow \iota$  be given. Let  $k5\_cat\_1 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k11\_cat\_4 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k10\_cat\_4 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k4\_cat\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k13\_cat\_4 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k12\_cat\_4 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k2\_cat\_1 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k1\_xboole\_0 : \iota$  be given. Let  $l1\_cat\_1 : \iota \Rightarrow o$  be given. Let  $m1\_cat\_1 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow o$  be given. Assume the following.

$$\begin{aligned} & \forall X0. ((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\ & X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\ & X0) \wedge ((v3\_cat\_4 X0) \wedge (l1\_cat\_4 X0)))))))))) \Rightarrow (\forall X1. (m1\_subset\_1 \\ & X1 (u1\_struct\_0 X0)) \Rightarrow ((k5\_cat\_1 X0 X1 (k2\_cat\_4 X0 (k1\_cat\_4 X0) \\ & X1) X1 (k11\_cat\_4 X0 X1) (k10\_cat\_4 X0 X1) = k4\_cat\_1 X0 X1) \wedge ((k5\_cat\_1 \\ & X0 (k2\_cat\_4 X0 (k1\_cat\_4 X0) X1) X1 (k2\_cat\_4 X0 (k1\_cat\_4 X0) X1) \\ & (k10\_cat\_4 X0 X1) (k11\_cat\_4 X0 X1) = k4\_cat\_1 X0 (k2\_cat\_4 X0 (k1\_cat\_4 \\ & X0) X1)) \wedge ((k5\_cat\_1 X0 X1 (k2\_cat\_4 X0 X1 (k1\_cat\_4 X0) X1) (k13\_cat\_4 \\ & X0 X1) (k12\_cat\_4 X0 X1) = k4\_cat\_1 X0 X1) \wedge (k5\_cat\_1 X0 (k2\_cat\_4 \\ & X0 X1 (k1\_cat\_4 X0) X1 (k2\_cat\_4 X0 X1 (k1\_cat\_4 X0) (k12\_cat\_4 \\ & X0 X1) (k13\_cat\_4 X0 X1) = k4\_cat\_1 X0 (k2\_cat\_4 X0 X1 (k1\_cat\_4 X0))))))))) \end{aligned} \tag{1}$$

Assume the following.

$$\begin{aligned} & \forall X0. ((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\ & X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\ & X0) \wedge ((v3\_cat\_4 X0) \wedge (l1\_cat\_4 X0)))))))))) \Rightarrow (\forall X1. (m1\_subset\_1 \\ & X1 (u1\_struct\_0 X0)) \Rightarrow ((k2\_cat\_1 X0 X1 (k2\_cat\_4 X0 X1 (k1\_cat\_4 \\ & X0)) \neq k1\_xboole\_0) \wedge (k2\_cat\_1 X0 X1 (k2\_cat\_4 X0 (k1\_cat\_4 X0) X1) \neq \\ & k1\_xboole\_0))) \end{aligned} \tag{2}$$

Assume the following.

$$\begin{aligned} & \forall X0.((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\ & X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\ & X0) \wedge ((v3\_cat\_4 X0) \wedge (l1\_cat\_4 X0)))))))))) \Rightarrow (\forall X1.(m1\_subset\_1 \\ & X1 (u1\_struct\_0 X0)) \Rightarrow (\forall X2.(m1\_subset\_1 X2 (u1\_struct\_0 \\ & X0)) \Rightarrow ((k2\_cat\_1 X0 (k2\_cat\_4 X0 X1 X2) X1 \neq k1\_xboole\_0) \wedge (k2\_cat\_1 \\ & X0 (k2\_cat\_4 X0 X1 X2) X2 \neq k1\_xboole\_0)))) \end{aligned} \quad (3)$$

Assume the following.

$$\forall X0.(l1\_cat\_4 X0) \Rightarrow (l1\_cat\_1 X0) \quad (4)$$

Assume the following.

$$\begin{aligned} & \forall X0.\forall X1.\forall X2.(((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 \\ & X0) \wedge (l1\_cat\_4 X0))) \wedge ((m1\_subset\_1 X1 (u1\_struct\_0 X0)) \wedge (m1\_subset\_1 \\ & X2 (u1\_struct\_0 X0)))) \Rightarrow (m1\_subset\_1 (k2\_cat\_4 X0 X1 X2) (u1\_struct\_0 \\ & X0)) \end{aligned} \quad (5)$$

Assume the following.

$$\forall X0.((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge (l1\_cat\_4 X0))) \Rightarrow (m1\_subset\_1 (k1\_cat\_4 X0) (u1\_struct\_0 X0)) \quad (6)$$

Assume the following.

$$\begin{aligned} & \forall X0.\forall X1.(((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge \\ & ((v2\_cat\_1 X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge \\ & ((v6\_cat\_1 X0) \wedge ((v3\_cat\_4 X0) \wedge (l1\_cat\_4 X0)))))))))) \wedge (m1\_subset\_1 \\ & X1 (u1\_struct\_0 X0))) \Rightarrow (m1\_cat\_1 (k13\_cat\_4 X0 X1) X0 X1 (k2\_cat\_4 \\ & X0 X1 (k1\_cat\_4 X0))) \end{aligned} \quad (7)$$

Assume the following.

$$\begin{aligned} & \forall X0.\forall X1.(((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge \\ & ((v2\_cat\_1 X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge \\ & ((v6\_cat\_1 X0) \wedge ((v3\_cat\_4 X0) \wedge (l1\_cat\_4 X0)))))))))) \wedge (m1\_subset\_1 \\ & X1 (u1\_struct\_0 X0))) \Rightarrow (m1\_cat\_1 (k12\_cat\_4 X0 X1) X0 (k2\_cat\_4 \\ & X0 X1 (k1\_cat\_4 X0)) X1) \end{aligned} \quad (8)$$

Assume the following.

$$\begin{aligned} & \forall X0.\forall X1.(((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge \\ & ((v2\_cat\_1 X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge \\ & ((v6\_cat\_1 X0) \wedge ((v3\_cat\_4 X0) \wedge (l1\_cat\_4 X0)))))))))) \wedge (m1\_subset\_1 \\ & X1 (u1\_struct\_0 X0))) \Rightarrow (m1\_cat\_1 (k11\_cat\_4 X0 X1) X0 X1 (k2\_cat\_4 \\ & X0 (k1\_cat\_4 X0) X1)) \end{aligned} \quad (9)$$

Assume the following.

$$\begin{aligned} & \forall X0. \forall X1. (((\neg v2\_struct\_0 X0) \wedge (\neg v11\_struct\_0 X0) \wedge \\ & ((v2\_cat\_1 X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge \\ & ((v6\_cat\_1 X0) \wedge ((v3\_cat\_4 X0) \wedge (l1\_cat\_4 X0)))))))))) \wedge (m1\_subset\_1 \\ & X1 (u1\_struct\_0 X0)) \Rightarrow (m1\_cat\_1 (k10\_cat\_4 X0 X1) X0 (k2\_cat\_4 \\ & X0 (k1\_cat\_4 X0) X1) X1) \end{aligned} \quad (10)$$

Assume the following.

$$\begin{aligned} & \forall X0. ((\neg v2\_struct\_0 X0) \wedge (\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\ & X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\ & X0) \wedge (l1\_cat\_1 X0)))))))) \Rightarrow (\forall X1. (m1\_subset\_1 X1 (u1\_struct\_0 \\ & X0)) \Rightarrow (\forall X2. (m1\_subset\_1 X2 (u1\_struct\_0 X0)) \Rightarrow ((r1\_cat\_1 \\ & X0 X1 X2) \Leftrightarrow ((k2\_cat\_1 X0 X1 X2 \neq k1\_xboole\_0) \wedge ((k2\_cat\_1 X0 X2 X1 \neq \\ & k1\_xboole\_0) \wedge (\exists X3. (m1\_cat\_1 X3 X0 X1 X2) \wedge (\exists X4. ( \\ & m1\_cat\_1 X4 X0 X2 X1) \wedge ((k5\_cat\_1 X0 X2 X1 X2 X4 X3 = k4\_cat\_1 X0 X2) \wedge \\ & (k5\_cat\_1 X0 X1 X2 X1 X3 X4 = k4\_cat\_1 X0 X1)))))))))) \end{aligned} \quad (11)$$

**Theorem 1**

$$\begin{aligned} & \forall X0. ((\neg v2\_struct\_0 X0) \wedge (\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\ & X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\ & X0) \wedge ((v3\_cat\_4 X0) \wedge (l1\_cat\_4 X0)))))))) \Rightarrow (\forall X1. (m1\_subset\_1 \\ & X1 (u1\_struct\_0 X0)) \Rightarrow ((r1\_cat\_1 X0 X1 (k2\_cat\_4 X0 X1 (k1\_cat\_4 \\ & X0))) \wedge (r1\_cat\_1 X0 X1 (k2\_cat\_4 X0 (k1\_cat\_4 X0) X1)))) \end{aligned}$$