problem 6 :

$\neg \alpha = \neg \forall x \; S(f(f(f(cat))), x, y_6)$

$= \neg S(f(f(f(cat))), x_1, y_3)$

KB 1 and KB 2 :

① $S(cat, x_2, x_2)$

② $\neg S(x_3, y_3, z_3) \vee S(f(x_3), y_3, f(z_3))$

③ (KB2 $\wedge \neg \alpha$) :

$\equiv \neg S(f(f(cat)), x, z_3) \vee S(f(f(f(cat))), x, f(z_3))$

$\vee \neg S(f(f(f(cat))), x, f(z_3))$

$\equiv \neg S(f(f(cat)), x, z_4)$

④ from KB2 and ③ :

$\equiv \neg S(f(cat), x, z_3) \vee S(f(f(cat)), x, f(z_3))$

$\vee \neg S(f(f(cat)), x, z_3)$

$= \neg S(f(cat), x, z_5)$

⑤ from KB2 and ④ :

$\equiv \neg S(cat, x, z_3) \vee S(f(cat), x, f(z_3))$

$\vee \neg S(f(cat), x, f(z_3))$

$= \neg S(cat, x, z_5)$

⑥ from KB1 and ⑤ :

$\equiv S(cat, x, x) \vee \neg S(cat, x, x) = \{\}$

KB entails α