

problem 6:

$$\begin{aligned}\# \neg d &= \neg \forall x \ S(f(f(f(cat))), x, y_e) \\ &= \neg S(f(f(f(cat))), x_1, y_3)\end{aligned}$$

KB 1 and KB 2 :

$$\textcircled{1} S(cat, x_2, x_2)$$

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

$$\textcircled{3} (KB_2 \wedge \neg d):$$

$$\begin{aligned}&= \neg S(f(f(cat)), x, z_3) \vee S(f(f(f(cat))), x, f(z_3)) \\ &\quad \vee \neg S(f(f(f(cat))), x, f(z_3)) \\ &= \neg S(f(f(cat)), x, z_4)\end{aligned}$$

$$\textcircled{4} \text{ from } KB_2 \text{ and } \underline{\underline{3}}:$$

$$\begin{aligned}&= \neg S(f(cat), x, z_3) \vee S(f(f(cat)), x, f(z_3)) \\ &\quad \vee \neg S(f(f(cat)), x, z_3) \\ &= \neg S(f(cat), x, z_5)\end{aligned}$$

$$\textcircled{5} \text{ From } KB_2 \text{ and } \underline{\underline{4}}:$$

$$\begin{aligned}&= \neg S(cat, x, z_3) \vee S(f(cat), x, f(z_3)) \\ &\quad \vee \neg S(f(cat), x, f(z_3)) \\ &= \neg S(cat, x, z_5)\end{aligned}$$

$$\textcircled{6} \text{ From } KB_1 \text{ and } \underline{\underline{5}}:$$

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

KB entails d