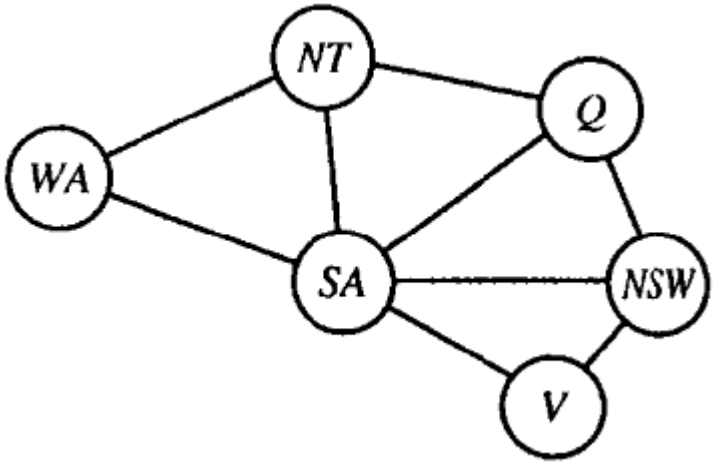
人工智能习题课

5.8 跑一遍AC-3算法：

WA=R

V=B



a. Remove $SA - WA$, delete R from SA.
b. Remove $SA - V$, delete B from SA, leaving only G.
c. Remove $NT - WA$, delete R from NT.
d. Remove $NT - SA$, delete G from NT, leaving only B.
e. Remove $NSW - SA$, delete G from NSW.
f. Remove $NSW - V$, delete B from NSW, leaving only R.
g. Remove $Q - NT$, delete B from Q.
h. Remove $Q - SA$, delete G from Q.
i. remove $Q - NSW$, delete R from Q, leaving no domain for Q.

Q中为空

5.9

感觉题目有点问题

1. 树状结构，每条弧至多进入队列至多1次，相容性检验需 d^2 ，因此，复杂度为 $O(nd^2)$

2. 使用AC-3算法，每条弧进入队列至多 d次，相容性检验需 d^2 ，因此，复杂度为 $O(nd^3)$

7.12

a.

$$P \Rightarrow Q \iff \neg P \vee Q$$

$$\neg(P_1 \wedge \cdots \wedge P_m) \iff (\neg P_1 \vee \cdots \vee \neg P_m)$$

$$\therefore \quad (\neg P_1 \vee \cdots \vee \neg P_m \vee Q) \iff (P_1 \wedge \cdots \wedge P_m) \Rightarrow Q$$

b. 任意子句可写成：

$$(\neg P_1 \vee \cdots \vee \neg P_m \vee Q_1 \vee \cdots \vee Q_n)$$

$$\Updownarrow$$

$$(P_1 \wedge \cdots \wedge P_m) \Rightarrow Q_1 \vee \cdots \vee Q_n$$

$$P \vee Q \iff \neg P \Rightarrow Q$$

c.

For atoms p_i, q_i, r_i, s_i where $\text{UNIFY}(p_j, q_k) = \theta$:

$$\frac{p_1 \wedge \ldots\ p_j\ \ldots \wedge p_{n_1} \Rightarrow r_1 \vee \ldots r_{n_2} \qquad s_1 \wedge \ldots \wedge s_{n_3} \Rightarrow q_1 \vee \ldots\ q_k\ \ldots \vee q_{n_4}}{\text{SUBST}(\theta, (p_1 \wedge \ldots p_{j-1} \wedge p_{j+1} \wedge p_{n_1} \wedge s_1 \wedge \ldots s_{n_3} \Rightarrow r_1 \vee \ldots r_{n_2} \vee q_1 \vee \ldots\ q_{k-1} \vee q_{k+1} \vee \ldots \vee q_{n_4}))}$$

9.9

a. $Horse(x) \Rightarrow Mammal(x)$
$Cow(x) \Rightarrow Mammal(x)$
$Pig(x) \Rightarrow Mammal(x)$

b. $Offspring(x, y) \wedge Horse(y) \Rightarrow Horse(x)$

c. $Horse(Bluebeard)$

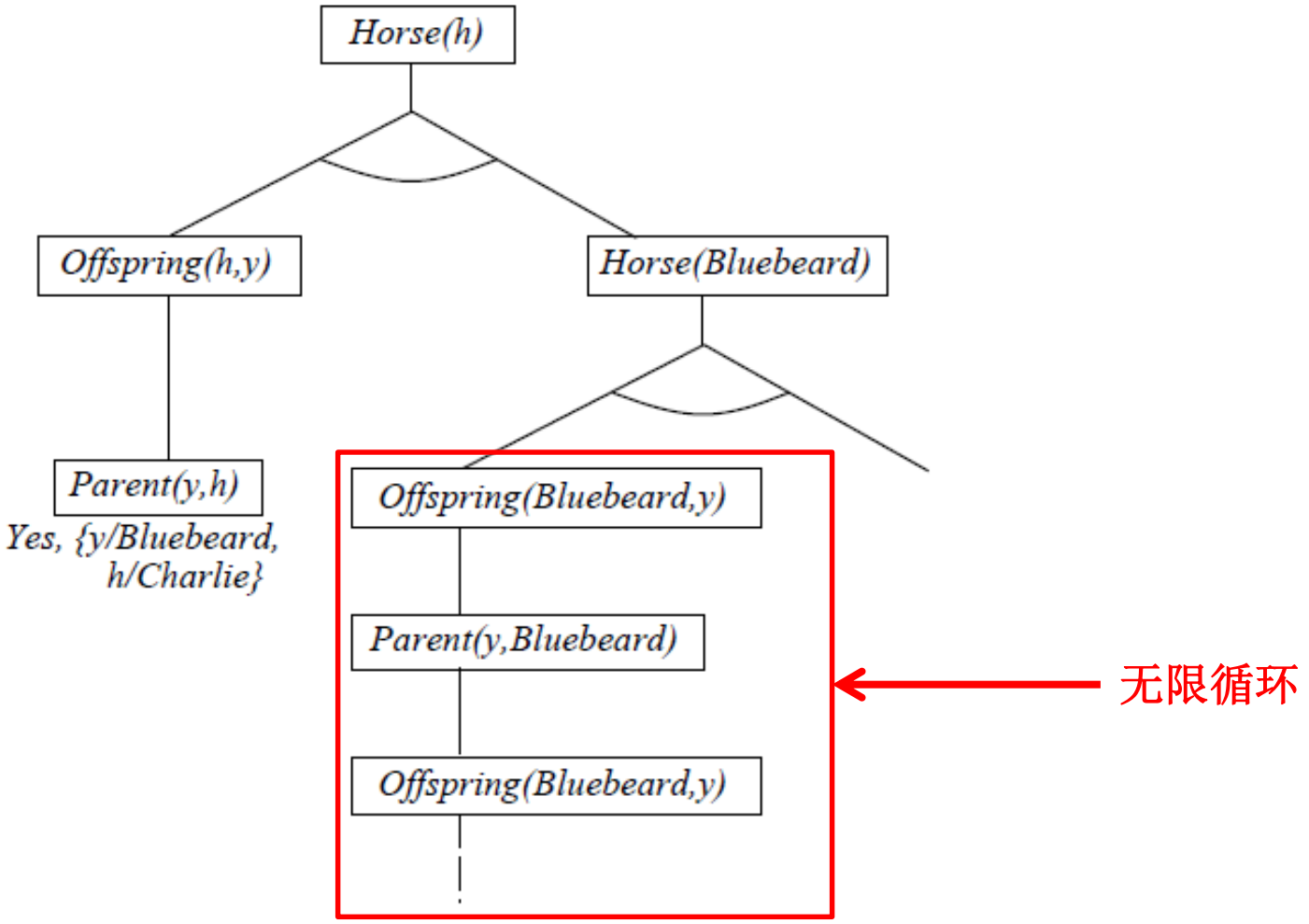
d. $Parent(Bluebeard, Charlie)$

e. $Offspring(x, y) \Rightarrow Parent(y, x)$
$Parent(x, y) \Rightarrow Offspring(y, x)$
(Note we couldn't do $Offspring(x, y) \Leftrightarrow Parent(y, x)$ because that is not in the form expected by Generalized Modus Ponens.)

f. $Mammal(x) \Rightarrow Parent(G(x), x)$ (here G is a Skolem function).

9.10

a. 证明树为：


Horse(h)
Offspring(h,y)
Horse(Bluebeard)
Parent(y,h)
Yes, {y/Bluebeard, h/Charlie}
Offspring(Bluebeard,y)
Parent(y,Bluebeard)
Offspring(Bluebeard,y)
无限循环

b. 因为规则b：一匹马的后代是马

$$Offspring(x, y) \wedge Horse(y) \Rightarrow Horse(x)$$

得到无限循环

c. 容易证明 Bluebeard 和 Charlie 都是马