

データベースシステム 中間確認 1-2

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中間確認 1-2

A	B	C	D	X,Y
T	T	T	T	F
F	T	T	T	T
T	F	T	T	F
T	T	F	T	F
T	T	T	F	T
F	F	T	T	F
F	T	F	T	F
F	T	T	F	T
T	F	F	T	T
T	F	T	F	F
T	T	F	F	F
F	F	F	T	T
F	F	T	F	T
F	T	F	F	F
T	F	F	F	T
F	F	F	F	T

i) 積和標準形

$X = T$ は 2, 5, 8, 9, 12, 13, 15, 16 行目であるからそれぞれについて, 命題変数 P が T なら P , F なら $\text{NOT } P$ とし, それらを AND でつなぎ, 各論理式を OR でつなぐ

$$\begin{aligned}
X = & \text{NOT } A \text{ AND } B \text{ AND } C \text{ AND } D \text{ OR} \\
& A \text{ AND } B \text{ AND } C \text{ AND NOT } D \text{ OR} \\
& \text{NOT } A \text{ AND } B \text{ AND } C \text{ AND NOT } D \text{ OR} \\
& A \text{ AND NOT } B \text{ AND NOT } C \text{ AND } D \text{ OR} \\
& \text{NOT } A \text{ AND NOT } B \text{ AND NOT } C \text{ AND } D \text{ OR} \\
& \text{NOT } A \text{ AND NOT } B \text{ AND } C \text{ AND NOT } D \text{ OR} \\
& A \text{ AND NOT } B \text{ AND NOT } C \text{ AND NOT } D \text{ OR} \\
& \text{NOT } A \text{ AND NOT } B \text{ AND NOT } C \text{ AND NOT } D
\end{aligned}$$

ii) 和積標準形

$Y = F$ は 1, 3, 4, 6, 7, 10, 11, 14 行目であるからそれぞれについて, 命題変数 P が T なら $\text{NOT } P$, F なら P とし, それらを OR でつなぎ, 各論理式を AND でつなぐ

$$\begin{aligned}
Y = & (\text{NOT } A \text{ OR NOT } B \text{ OR NOT } C \text{ OR NOT } D) \text{ AND} \\
& (\text{NOT } A \text{ OR } B \text{ OR NOT } C \text{ OR NOT } D) \text{ AND} \\
& (\text{NOT } A \text{ OR NOT } B \text{ OR } C \text{ OR NOT } D) \text{ AND} \\
& (A \text{ OR } B \text{ OR NOT } C \text{ OR NOT } D) \text{ AND} \\
& (A \text{ OR NOT } B \text{ OR } C \text{ OR NOT } D) \text{ AND} \\
& (\text{NOT } A \text{ OR } B \text{ OR NOT } C \text{ OR } D) \text{ AND} \\
& (\text{NOT } A \text{ OR NOT } B \text{ OR } C \text{ OR } D) \text{ AND} \\
& (A \text{ OR NOT } B \text{ OR } C \text{ OR } D)
\end{aligned}$$

iii) $X = Y$ を示す

1) 1 行目 : $A=T, B=T, C=T, D=T$ を代入

$$\begin{aligned}
X &= F \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } F \\
&= F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \\
&= F
\end{aligned}$$

$$\begin{aligned}
Y &= (F \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } T) \\
&= F \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= F
\end{aligned}$$

2) 2行目 : A=F, B=T, C=T, D=T を代入

$$\begin{aligned}
X &= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } F \\
&= T \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \\
&= T
\end{aligned}$$

$$\begin{aligned}
Y &= (T \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } T) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= T
\end{aligned}$$

3) 3行目 : A=T, B=F, C=T, D=T を代入

$$\begin{aligned}
X &= F \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } F \\
&= F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \\
&= F
\end{aligned}$$

$$\begin{aligned}
Y &= (F \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } T) \\
&= T \text{ AND } F \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= F
\end{aligned}$$

4) 4行目 : A=T, B=T, C=F, D=T を代入

$$\begin{aligned}
X &= F \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } F \\
&= F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \\
&= F
\end{aligned}$$

$$\begin{aligned}
Y &= (F \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } T) \\
&= T \text{ AND } T \text{ AND } F \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= F
\end{aligned}$$

5) 5行目 : A=T, B=T, C=T, D=F を代入

$$\begin{aligned}
X &= F \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } T \\
&= F \text{ OR } T \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \\
&= T
\end{aligned}$$

$$\begin{aligned}
Y &= (F \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } F) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= T
\end{aligned}$$

6) 6 行目 : A=F, B=F, C=T, D=T を代入

$$\begin{aligned}
X &= T \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } F \\
&= F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \\
&= F
\end{aligned}$$

$$\begin{aligned}
Y &= (T \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } T) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } F \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= F
\end{aligned}$$

7) 7行目 : A=F, B=T, C=F, D=T を代入

$$\begin{aligned}
X &= T \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } F \\
&= F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \\
&= F
\end{aligned}$$

$$\begin{aligned}
Y &= (T \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } T) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } F \text{ AND } T \text{ AND } T \text{ AND } T \\
&= F
\end{aligned}$$

8) 8行目 : A=F, B=T, C=T, D=F を代入

$$\begin{aligned}
X &= T \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } T \\
&= F \text{ OR } F \text{ OR } T \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \\
&= T
\end{aligned}$$

$$\begin{aligned}
Y &= (T \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } F) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= T
\end{aligned}$$

9) 9行目 : A=T, B=F, C=F, D=T を代入

$$\begin{aligned}
X &= F \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } F \\
&= F \text{ OR } F \text{ OR } F \text{ OR } T \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \\
&= T
\end{aligned}$$

$$\begin{aligned}
Y &= (F \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } T) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= T
\end{aligned}$$

10) 10 行目 : A=T, B=F, C=T, D=F を代入

$$\begin{aligned}
X &= F \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } T \\
&= F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \\
&= F
\end{aligned}$$

$$\begin{aligned}
Y &= (F \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } F) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } F \text{ AND } T \text{ AND } T \\
&= F
\end{aligned}$$

11) 11 行目 : A=T, B=T, C=F, D=F を代入

$$\begin{aligned}
X &= F \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } T \\
&= F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \\
&= F
\end{aligned}$$

$$\begin{aligned}
Y &= (F \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } F) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } F \text{ AND } T \\
&= F
\end{aligned}$$

12) 12 行目 : A=F, B=F, C=F, D=T を代入

$$\begin{aligned}
X &= T \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } F \\
&= F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } T \text{ OR } F \text{ OR } F \text{ OR } F \\
&= T
\end{aligned}$$

$$\begin{aligned}
Y &= (T \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } T) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= T
\end{aligned}$$

13) 13 行目 : A=F, B=F, C=T, D=F を代入

$$\begin{aligned}
X &= T \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } T \\
&= F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } T \text{ OR } F \text{ OR } F \\
&= T
\end{aligned}$$

$$\begin{aligned}
Y &= (T \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } F) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= T
\end{aligned}$$

14) 14 行目 : A=F, B=T, C=F, D=F を代入

$$\begin{aligned}
X &= T \text{ AND } T \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } T \text{ AND } T \\
&= F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \\
&= F
\end{aligned}$$

$$\begin{aligned}
Y &= (T \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } F \text{ OR } F) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } F \\
&= F
\end{aligned}$$

15) 15 行目 : A=T, B=F, C=F, D=F を代入

$$\begin{aligned}
X &= F \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } T \\
&= F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } T \text{ OR } F \\
&= T
\end{aligned}$$

$$\begin{aligned}
Y &= (F \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } F) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= T
\end{aligned}$$

16) 16 行目 : A=F, B=F, C=F, D=F を代入

$$\begin{aligned}
X &= T \text{ AND } F \text{ AND } F \text{ AND } F \text{ OR} \\
&\quad F \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } F \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } F \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } F \text{ AND } T \text{ OR} \\
&\quad F \text{ AND } T \text{ AND } T \text{ AND } T \text{ OR} \\
&\quad T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } F \text{ OR } T \\
&= T
\end{aligned}$$

$$\begin{aligned}
Y &= (T \text{ OR } T \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } F \text{ OR } T \text{ OR } T) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } T) \text{ AND} \\
&\quad (T \text{ OR } F \text{ OR } T \text{ OR } F) \text{ AND} \\
&\quad (T \text{ OR } T \text{ OR } F \text{ OR } F) \text{ AND} \\
&\quad (F \text{ OR } T \text{ OR } F \text{ OR } F) \\
&= T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \text{ AND } T \\
&= T
\end{aligned}$$

以上 (1) \rightarrow (16) の結果より, $X=Y$ が示された