Truth table algorithms

Enter : f (logic function), variable (a,b,c,d,$\cdots$)
Exit : f, f1 (first canonic form), f2 (second canonic form)
First, we enter a binary values for each variable 0 (False) and 1 (True).
Then, we calculate it according to these calculation rules :

Base operation

- NOT ($\bar{a}$) : inverse or a complementary.
- AND (ab or $a\dot{b}$) : return 1 if a and b is 1, else return 0.
- OR ($a+b$) : return 1 if one of a and b is 1, else if a and b are 0 he returns 0.

Base property

- Involution : $\bar{\bar{a}} = a$
- Idempotence : $\begin{cases} a+a = a \\ a \cdot a = a \end{cases}$
- Neutral element : $\begin{cases} a = a \cdot 1 = 1 \cdot a \\ a = a + 0 = 0 + a \end{cases}$
- Absorbent : $\begin{cases} a + 1 = 1 + a = 1 \\ a \cdot 0 = 0 \cdot a = 0 \end{cases}$
- Associativity : $\begin{cases} (a+b)+c = a+(b+c) \\ (a \cdot b) \cdot c = a \cdot (b \cdot c) \end{cases}$
- Distributivity : $\begin{cases} a \cdot (b+c) = a \cdot + a \cdot c \\ a + (b \cdot c) = (a+b) \cdot (a+c) \end{cases}$
- Morgan's rule : $\begin{cases} \overline{a+b} = \bar{a} \cdot \bar{b} \\ \overline{a \cdot b} = \bar{a} + \bar{b} \end{cases}$
- Optimisation : $\begin{cases} a + \bar{a}b = a + b \\ a + bc = (a+b)(a+c) \end{cases}$

Canonic form

Minterms : a group of variable may be linked by AND (ex : abc).
Maxterms : a gorup of variable may be linked by OR (ex : $a+b+c$).

1^{st} **canonic form :** union (OR) of minterms
2^{th} **canonic form :** intersection (AND) of maxterms