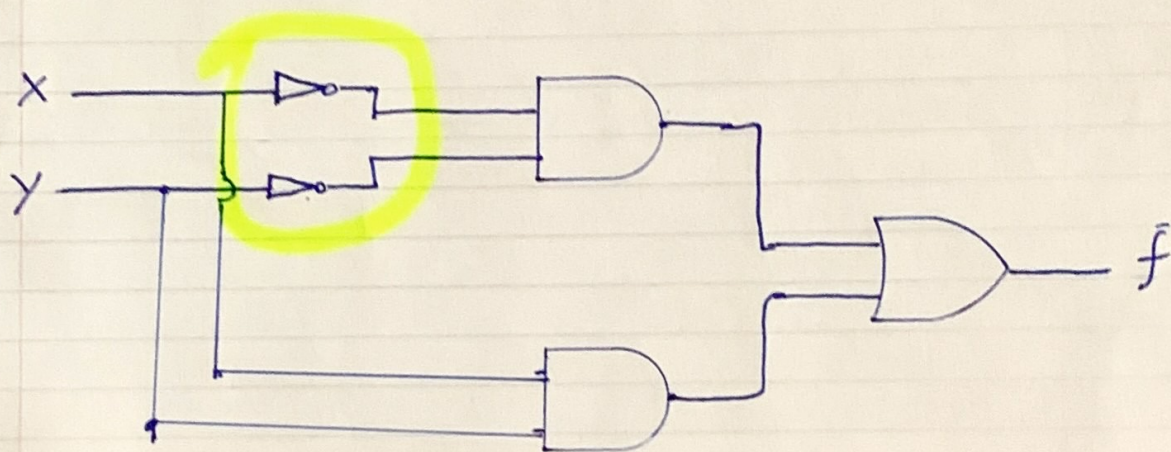


## Implementation of SOP Expression with NAND Gates.

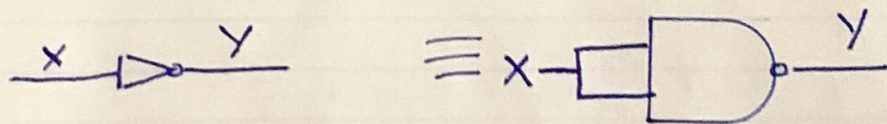
Theorem #1 :  $\overline{X \cdot Y} \Leftrightarrow \bar{X} + \bar{Y}$

Theorem #2 :  $\overline{X + Y} \Leftrightarrow \bar{X} \cdot \bar{Y}$

$$f = \bar{X} \cdot \bar{Y} + X \cdot Y$$



Step 1: Replace each not gate with its equivalent NAND gate by connecting inputs of a two input NAND gates to the single input of the not gate

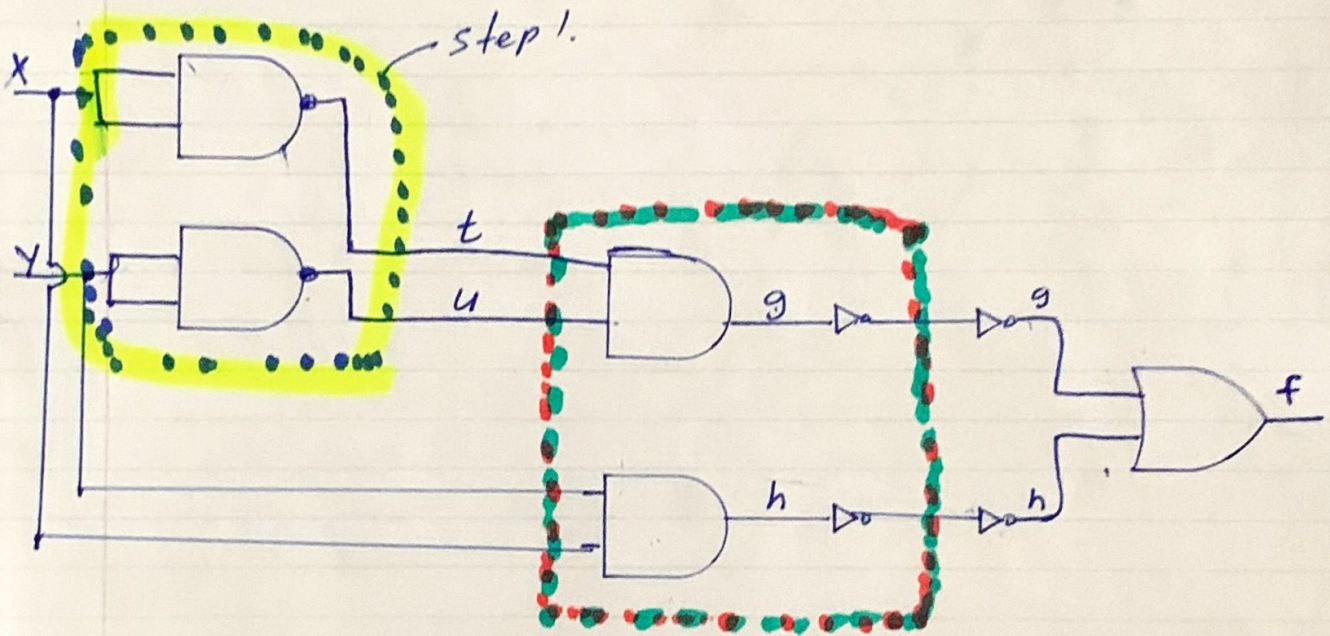




Step 2: Place two not gates on each end of the intermediate signals  $g$  and  $h$ . This will not change the output.

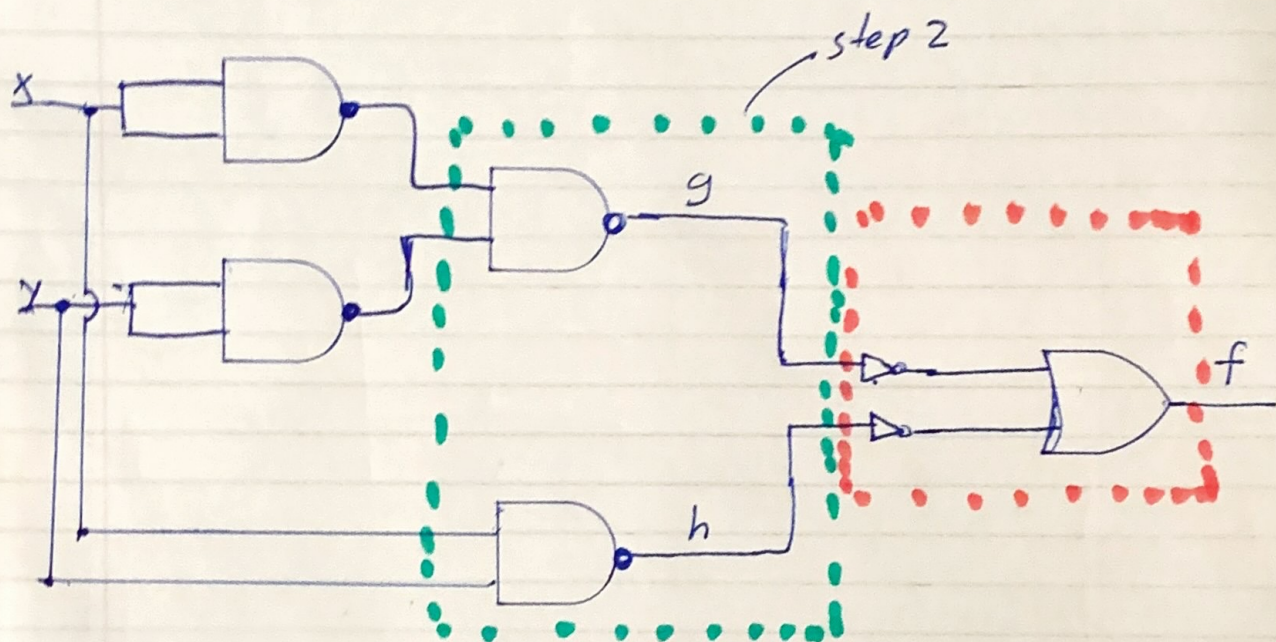
E.G.  $\bar{\bar{g}} = g$

An AND-OR gate with two not gate replaced.

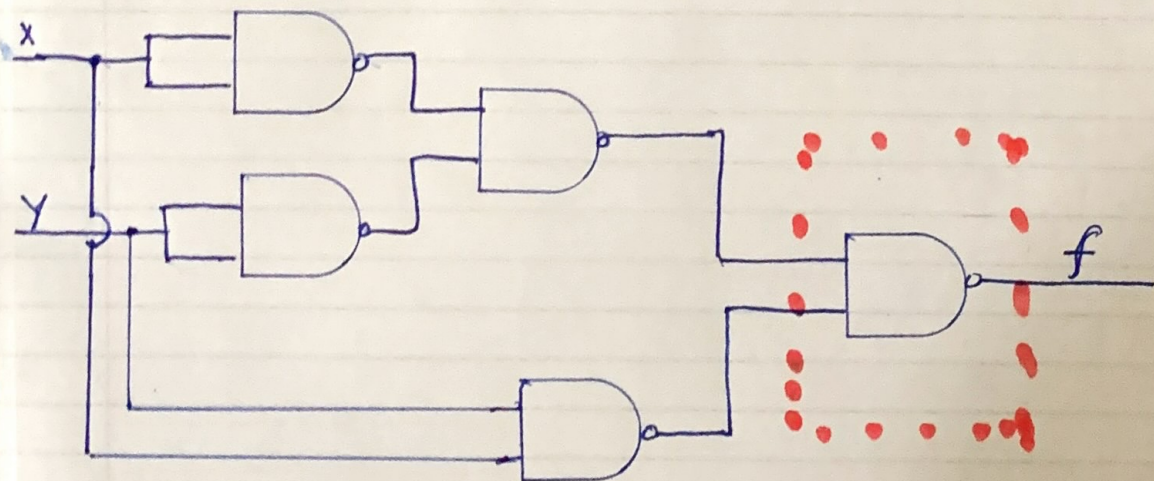




Step 3: Replace each AND-NOT gate with NAND gate.



Step 4: Replace OR gate with inverted input with NAND gate.



$$\bar{x} + \bar{y} \Leftrightarrow \overline{x \cdot y}$$