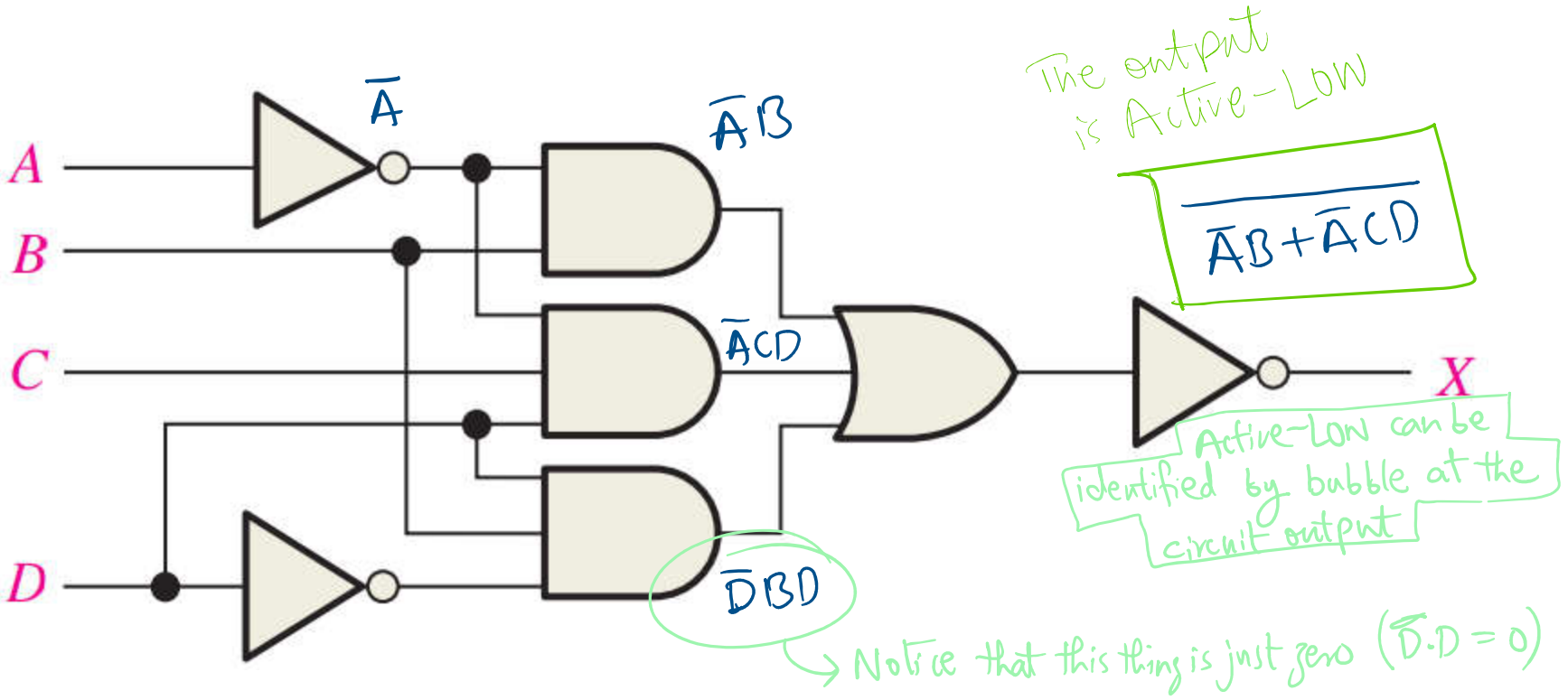
Combinational Logic / logic statements

Write the output expression for each circuit in Figure 5–54.



$\overline{\bar{A}B+\bar{A}CD}$ (Active low)

$0 = \overline{1} = \overline{(1)+(0)\,(0)+(1)}$

The output is low when A is low AND B is HIGH OR A is Low AND C is HIGH AND D is HIGH

$\bar{A}B = 1$

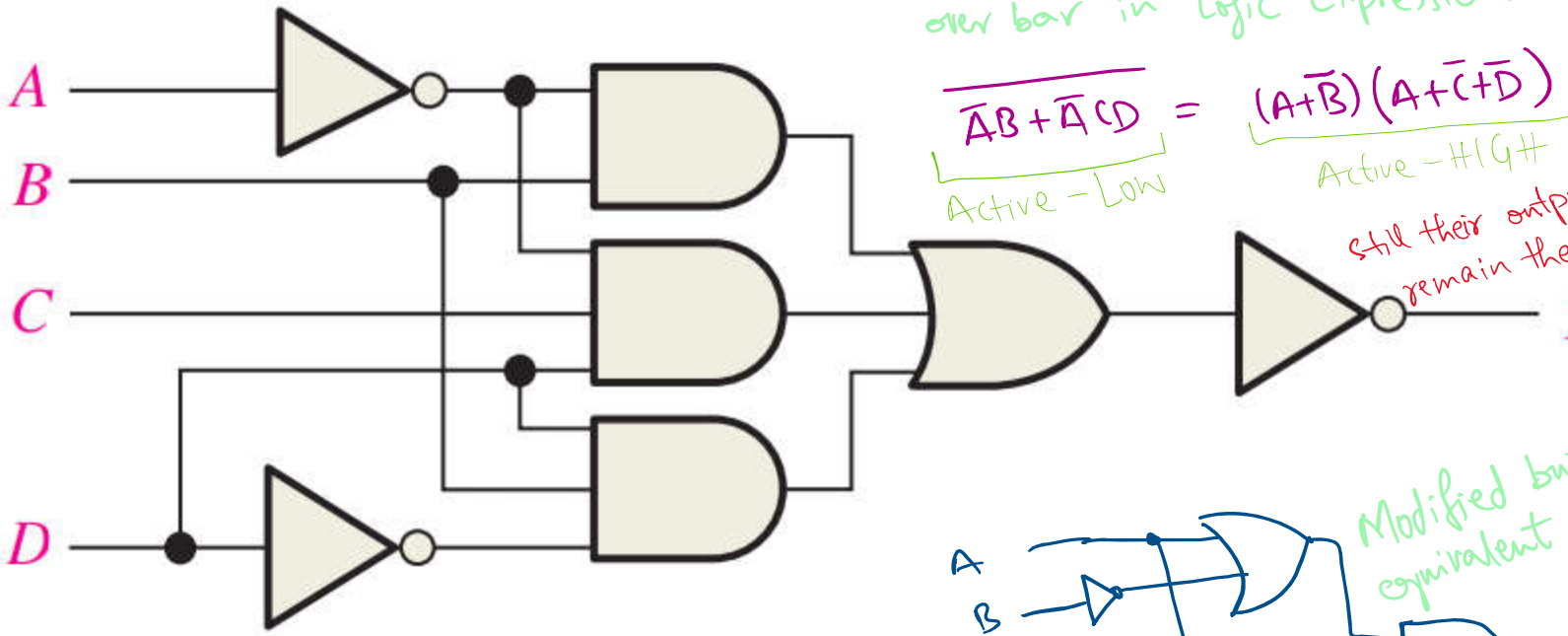
$\bar{A}CD = 1$

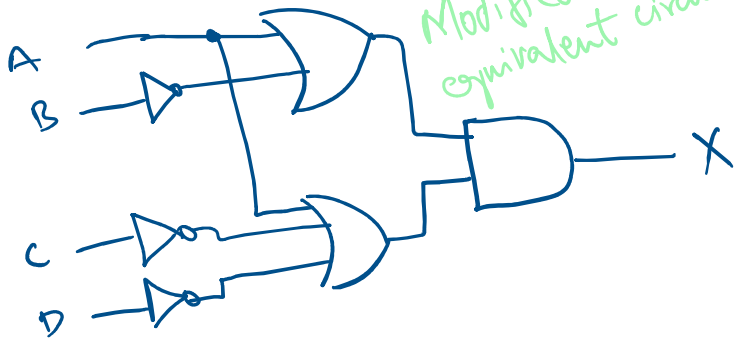
To convert this circuit into Active-HIGH, use DeMorgan's theorem to eleminate the over bar in Logic Expression

$\overline{\bar{A}B+\bar{A}CD} = (A+\bar{B})(A+\bar{C}+\bar{D})$

Active-Low = Active-HIGH

But still their outputs (truth tables) remain the same.

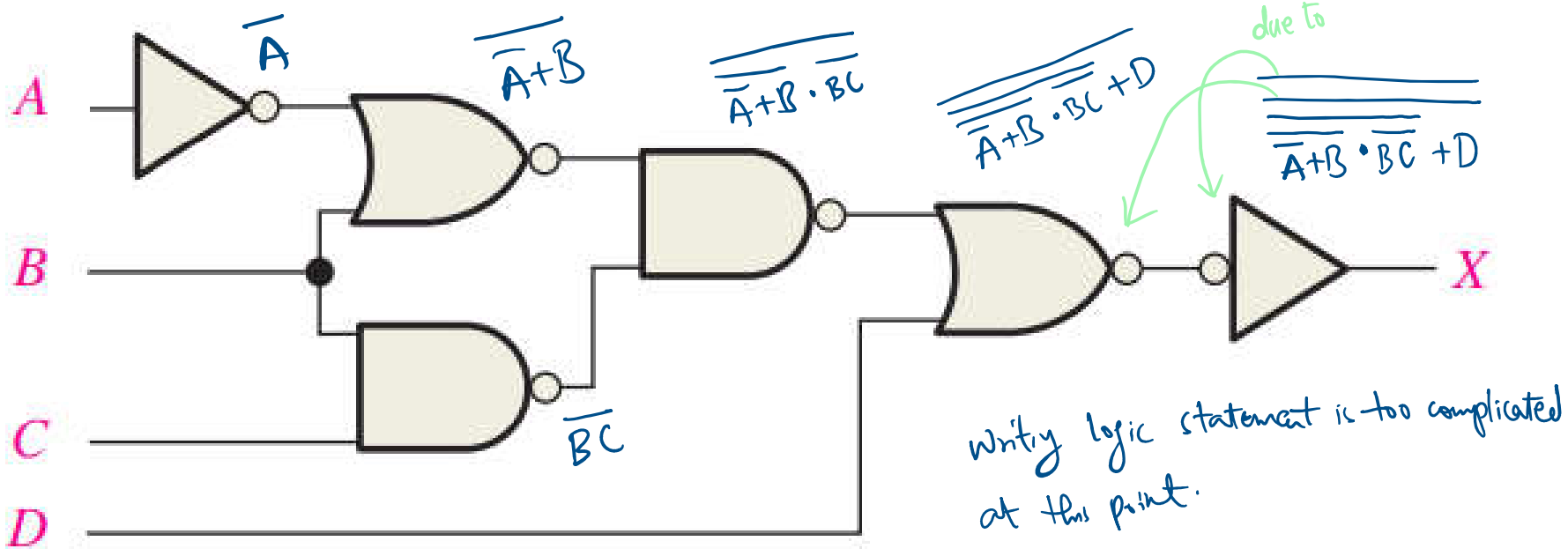




Modified but equivalent circuit

Combinational Logic / logic statements

Write the output expression for each circuit in Figure 5–54.



Combinational Logic / logic statements

To write logic statement we can first simplify the circuit.

1. Use Boolean Algebra
2. Use equivalent symbols

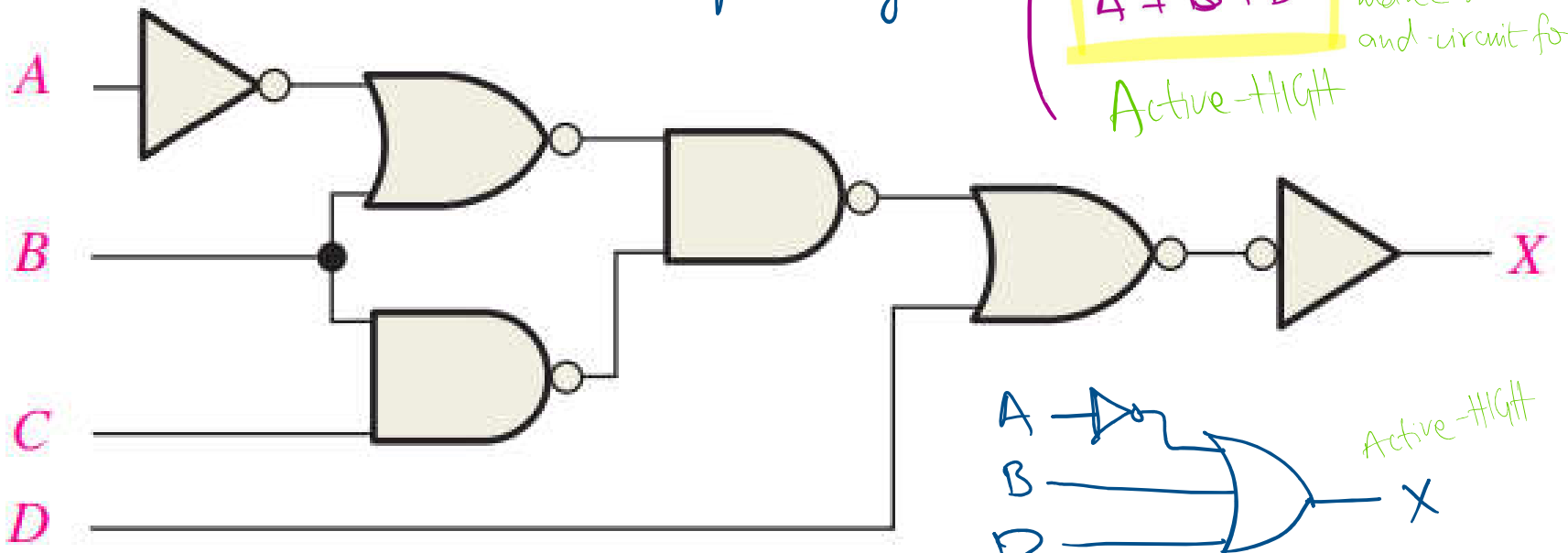
$\bar{A}+B \cdot \bar{B}C + D$

$\bar{A}+B+\bar{B}C+D$

$\bar{A}+B+BC+D$

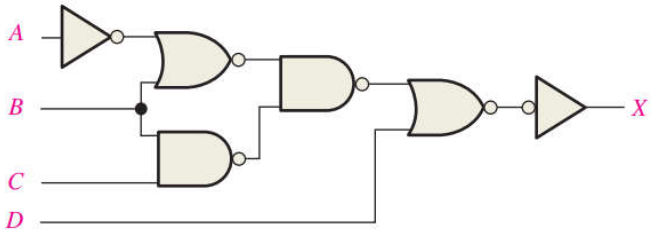
$\bar{A}+B+D$

much easier to make statement and circuit for Active-HIGH



1. The output is HIGH when D is HIGH OR B is HIGH OR A is LOW.
2. The output is HIGH when any of D [redacted] B is HIGH.

Combinational Logic / logic statements

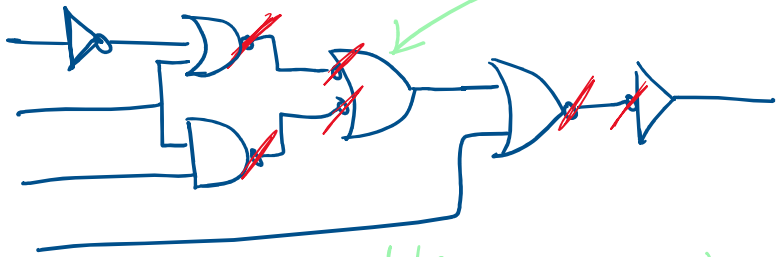


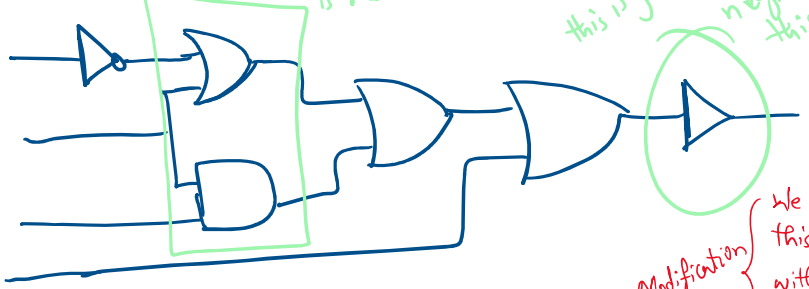
To write logic statement we can first simplify the circuit.

1. Use Boolean Algebra
2. Use equivalent symbols

Steps of conversion:

converted

① 

② 

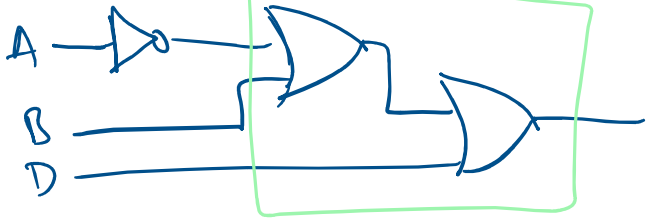
only from Boolean algebra we see that this is reducible

without bubble this is just a buffer

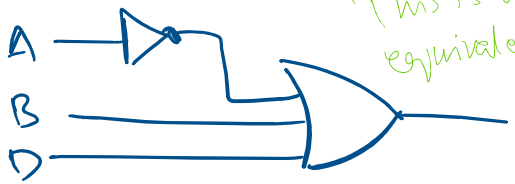
neglect this

modification of circuit

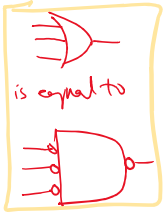
We can still convert this into Active-Low with changing the output (truth table) of the circuit.

③ 

Both OR gates can be merged as well

④ 

This is an active-High equivalent circuit.



is equal to