

Aula 6



Equivalência de Portas

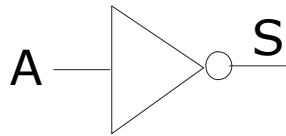
Índice

Objetivos de se usar as equivalências de portas lógicas:

- No projeto, ter a possibilidade de aproveitar portas lógicas que estão sobrando em CIs fazendo associação delas para formar outras funções lógicas necessárias no circuito, conseguindo desta forma reduzir a quantidade de CIs utilizados.
- Na montagem, ter a possibilidade de substituir uma determinada porta faltante por uma associação de portas que formam a mesma função da porta faltante.
- Poder montar qualquer circuito lógico utilizando somente uma das portas lógicas universais.

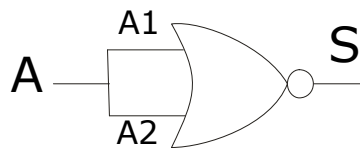
Função lógica NOT

$$S = \bar{A}$$

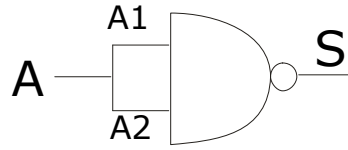


A	S
0	1
1	0

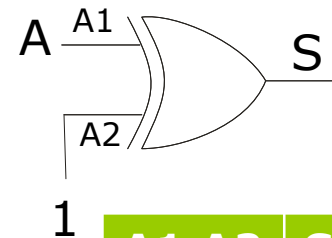
Circuitos equivalentes que executam a função NOT



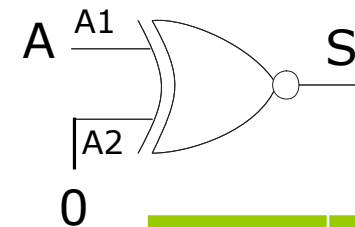
A1	A2	S
0	0	1
0	1	0
1	0	0
1	1	0



A1	A2	S
0	0	1
0	1	1
1	0	1
1	1	0



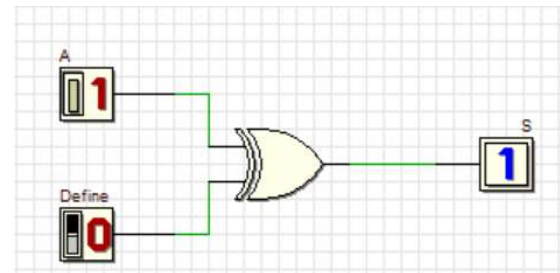
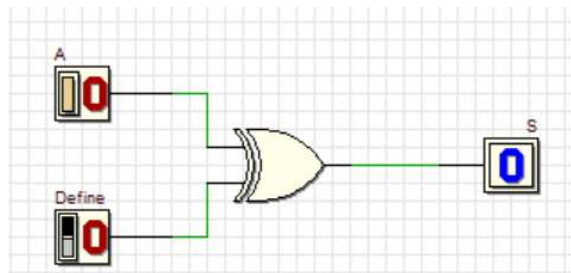
A1	A2	S
0	0	0
0	1	1
1	0	1
1	1	0



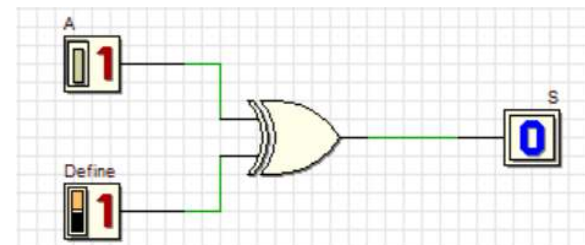
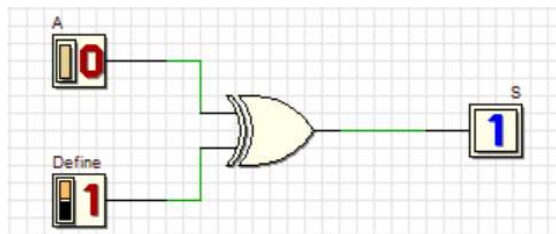
A1	A2	S
0	0	1
0	1	0
1	0	0
1	1	1

Função lógica NOT

Simulação da ou-exclusivo como inversora controlável.



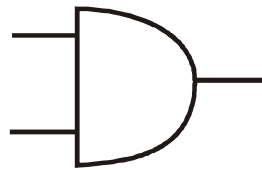
Com a entrada de controle definida como **zero**, a ou-exclusivo **não inverte** o sinal.



Com a entrada de controle definida como **um**, a ou-exclusivo **inverte** o sinal.

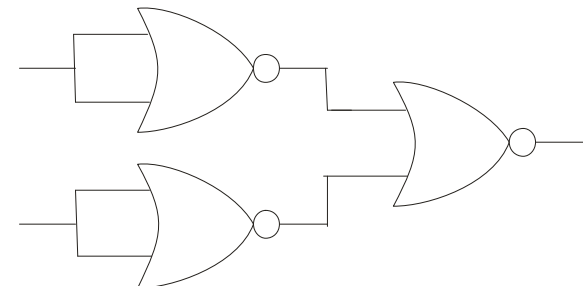
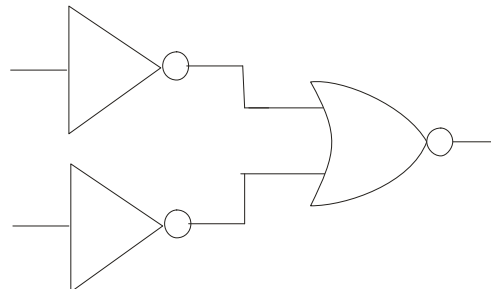
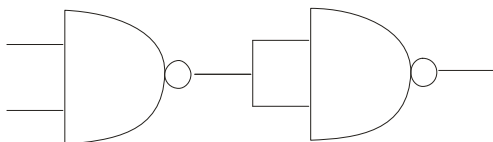
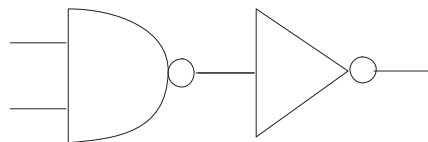
Função lógica AND

$$S = A \cdot B$$

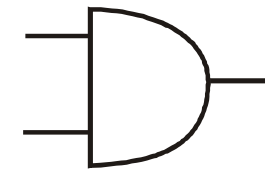
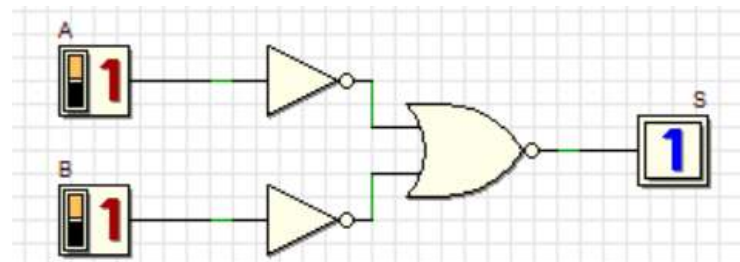
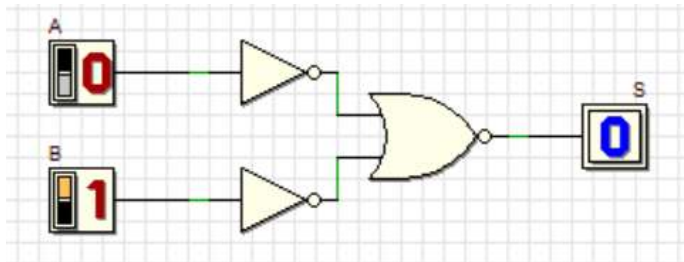
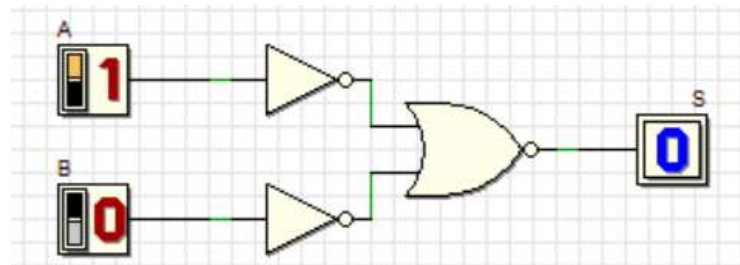
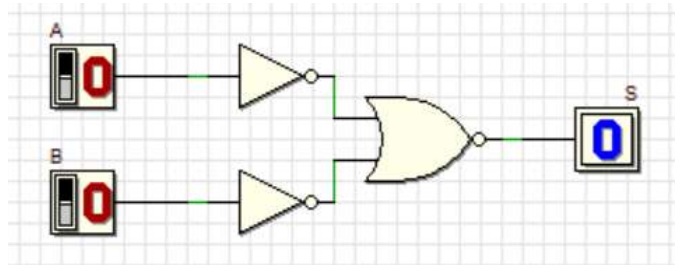


A	B	S
0	0	0
0	1	0
1	0	0
1	1	1

Circuitos Equivalentes que executam a função AND



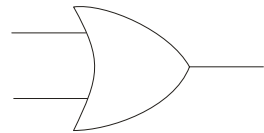
Função lógica AND



A	B	S
0	0	0
0	1	0
1	0	0
1	1	1

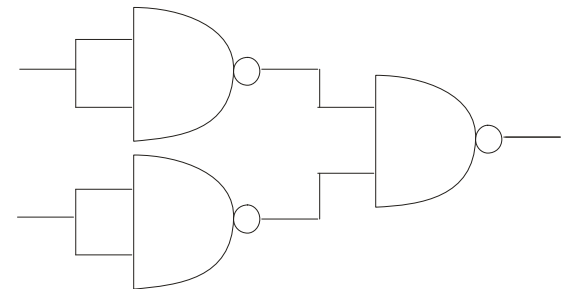
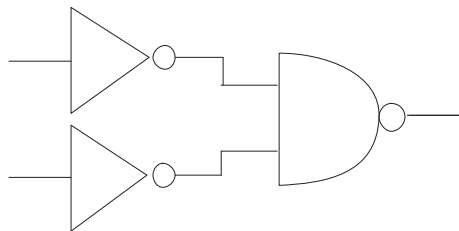
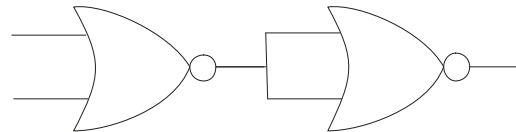
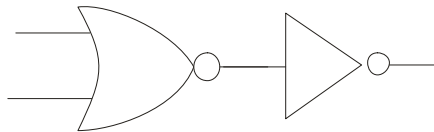
Função lógica OR

$$S = A + B$$



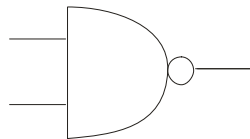
A	B	S
0	0	0
0	1	1
1	0	1
1	1	1

Circuitos Equivalentes que executam a função OR



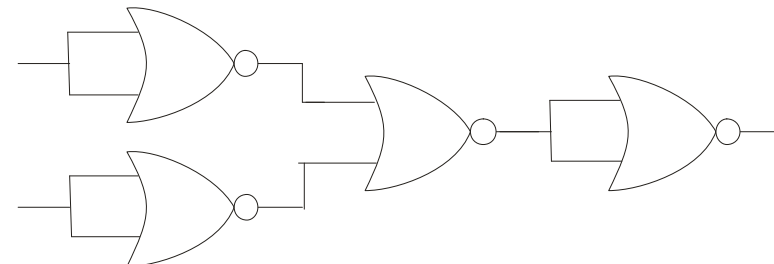
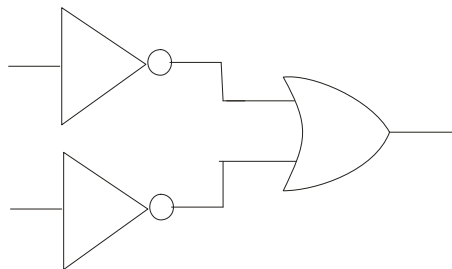
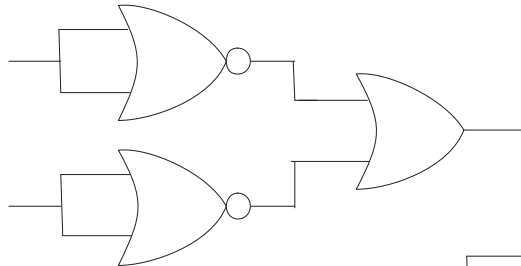
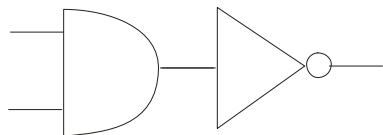
Função lógica NAND

$$S = \overline{A \cdot B}$$



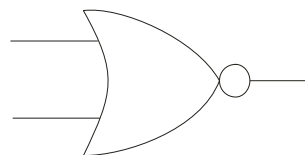
A	B	S
0	0	1
0	1	1
1	0	1
1	1	0

Circuitos Equivalentes que executam a função NAND



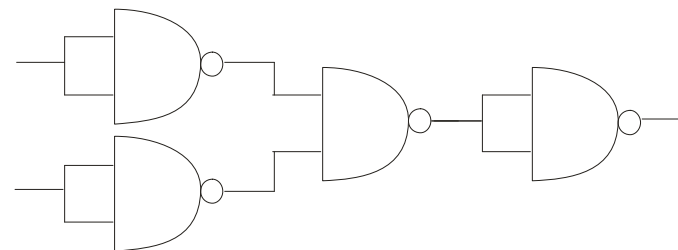
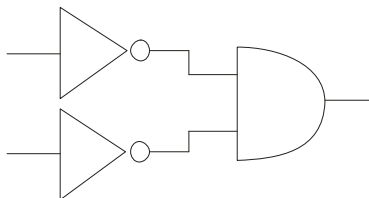
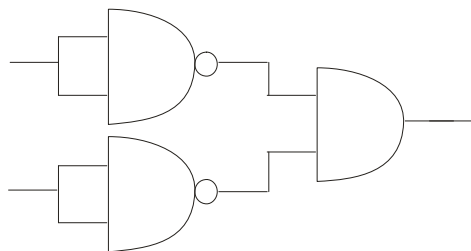
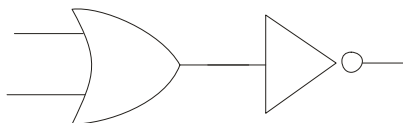
Função lógica NOR

$$S = \overline{A+B}$$

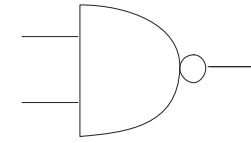


A	B	S
0	0	1
0	1	0
1	0	0
1	1	0

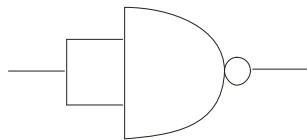
Circuitos Equivalentes que executam a função NOR



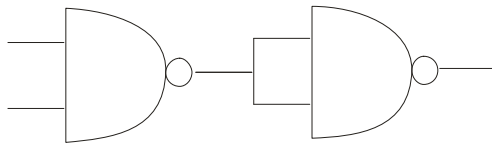
Porta universal NAND



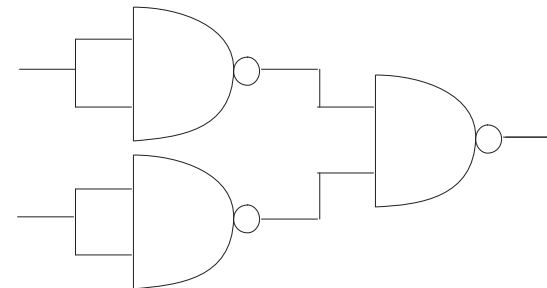
função NOT



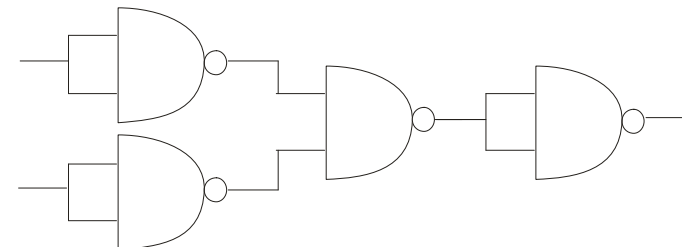
função AND



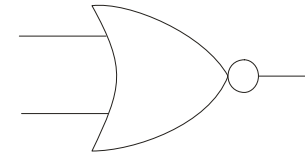
função OR



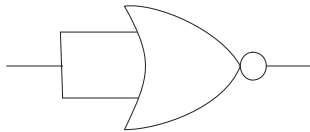
função NOR



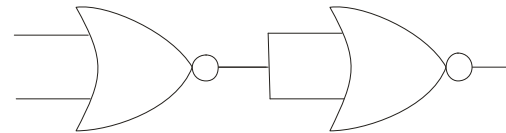
Porta universal NOR



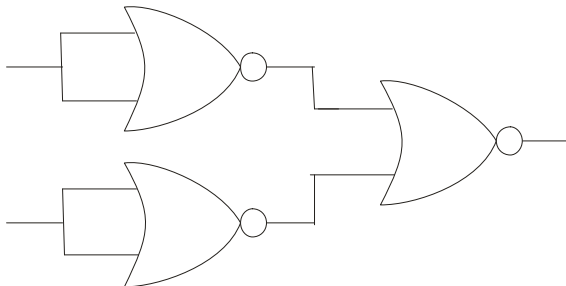
função NOT



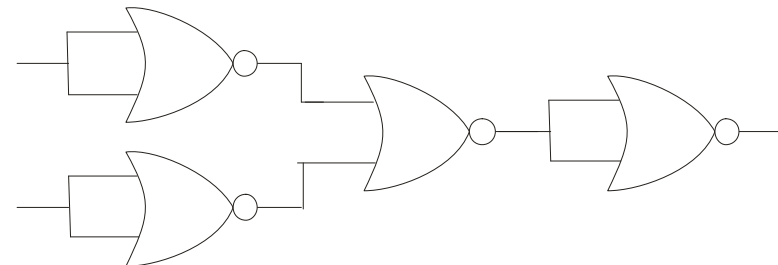
função OR



função AND



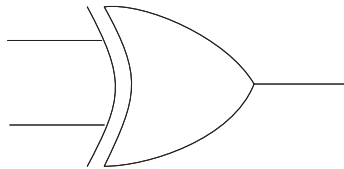
função NAND



Função lógica OU EXCLUSIVO

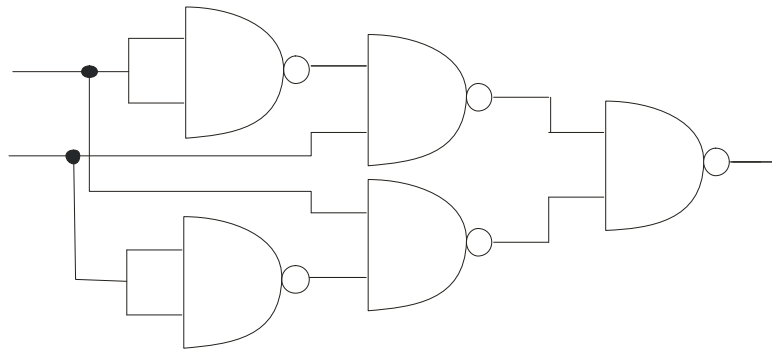
$$S = A \oplus B$$

$$S = \overline{A}.B + A.\overline{B}$$



A	B	S
0	0	0
0	1	1
1	0	1
1	1	0

Circuito Equivalente que executa a função EXOR somente com portas NAND

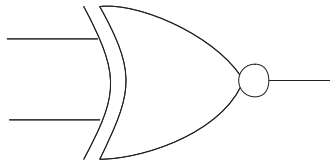


Função lógica NÃO OU EXCLUSIVO

“Coincidência”

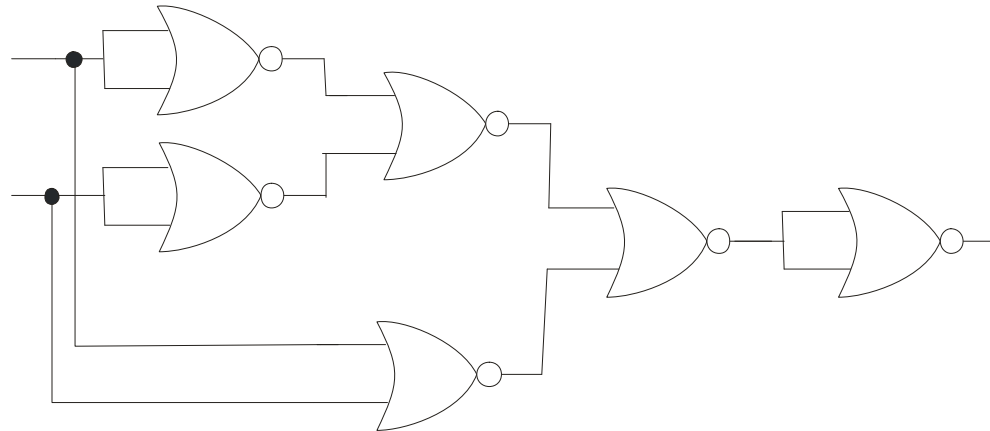
$$S = A \otimes B$$

$$S = A.B + \overline{A}.\overline{B}$$



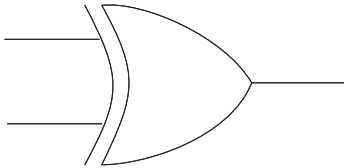
A	B	S
0	0	1
0	1	0
1	0	0
1	1	1

Circuito Equivalente que executa a função EXNOR somente com portas NOR

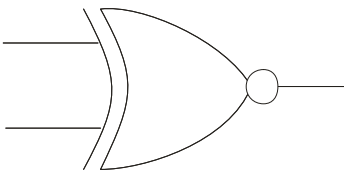


Desafio 1

1- Fazer uma ou-exclusivo utilizando somente portas NOR

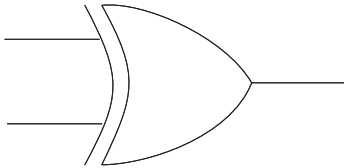


2- Fazer uma não-ou-exclusivo utilizando somente portas NAND



Desafio 2

3- Fazer uma ou-exclusivo utilizando somente 4 portas NAND



Atenção

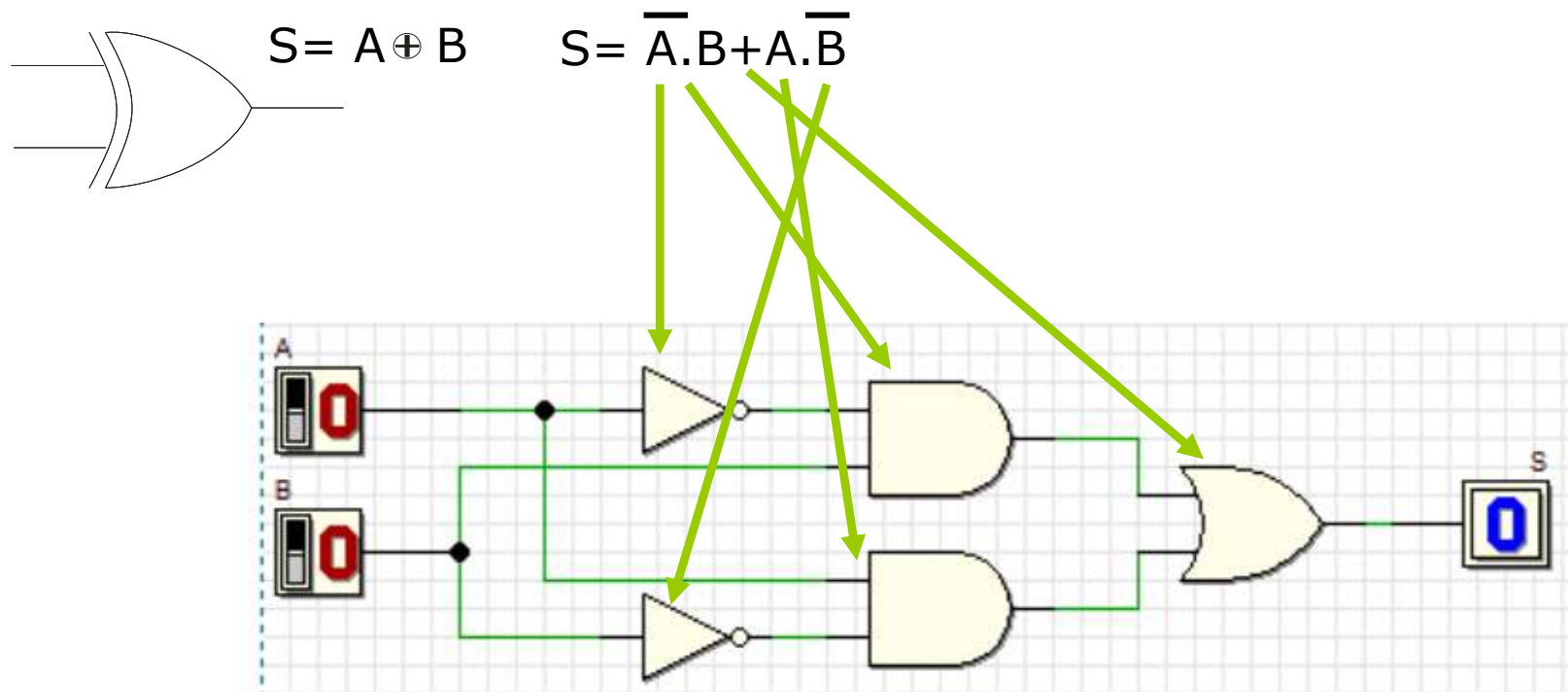


As cenas a seguir não devem ser assistidas se você ainda não tentou fazer os desafios propostos.
Risco de não aprender bem o assunto.

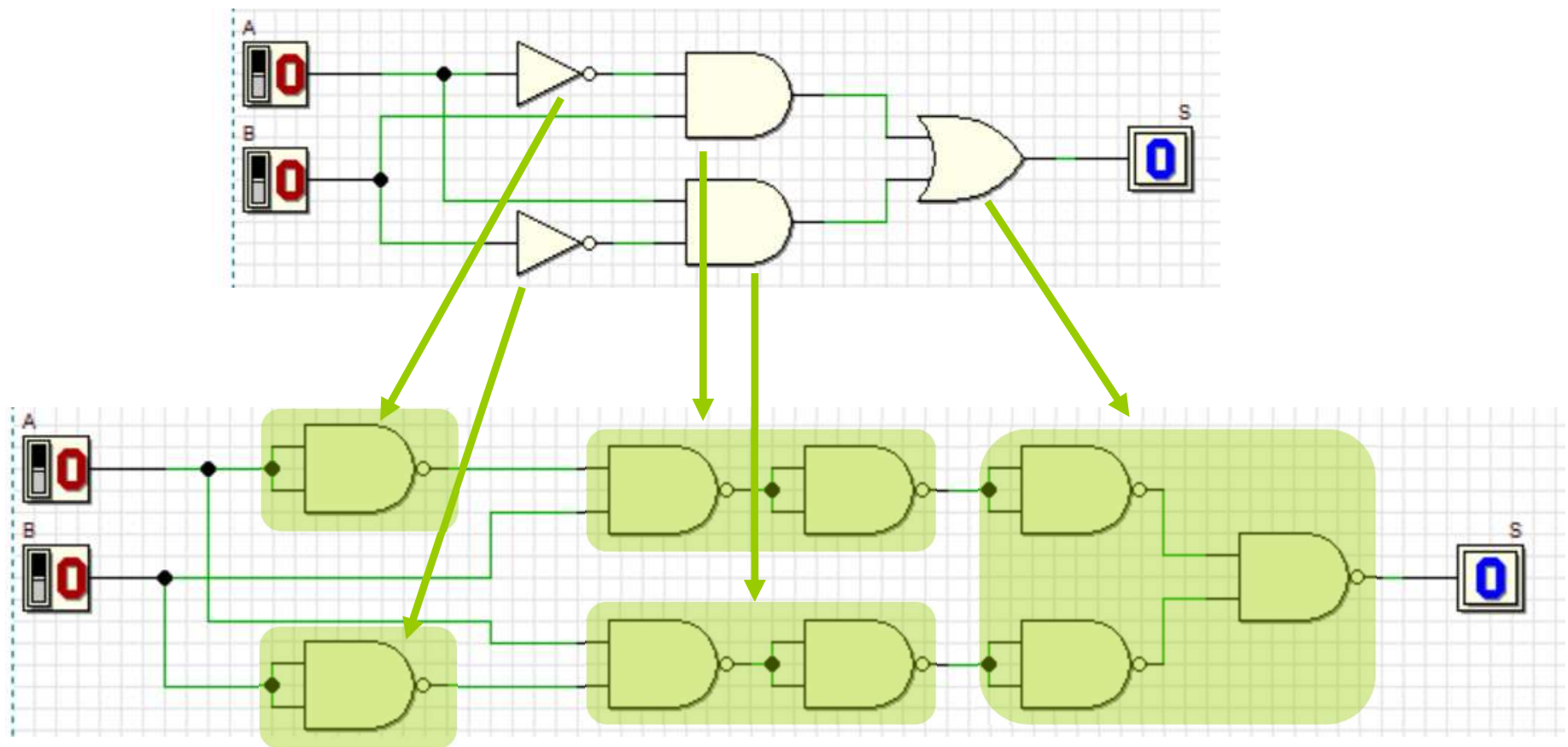


Função lógica OU-EXCLUSIVO

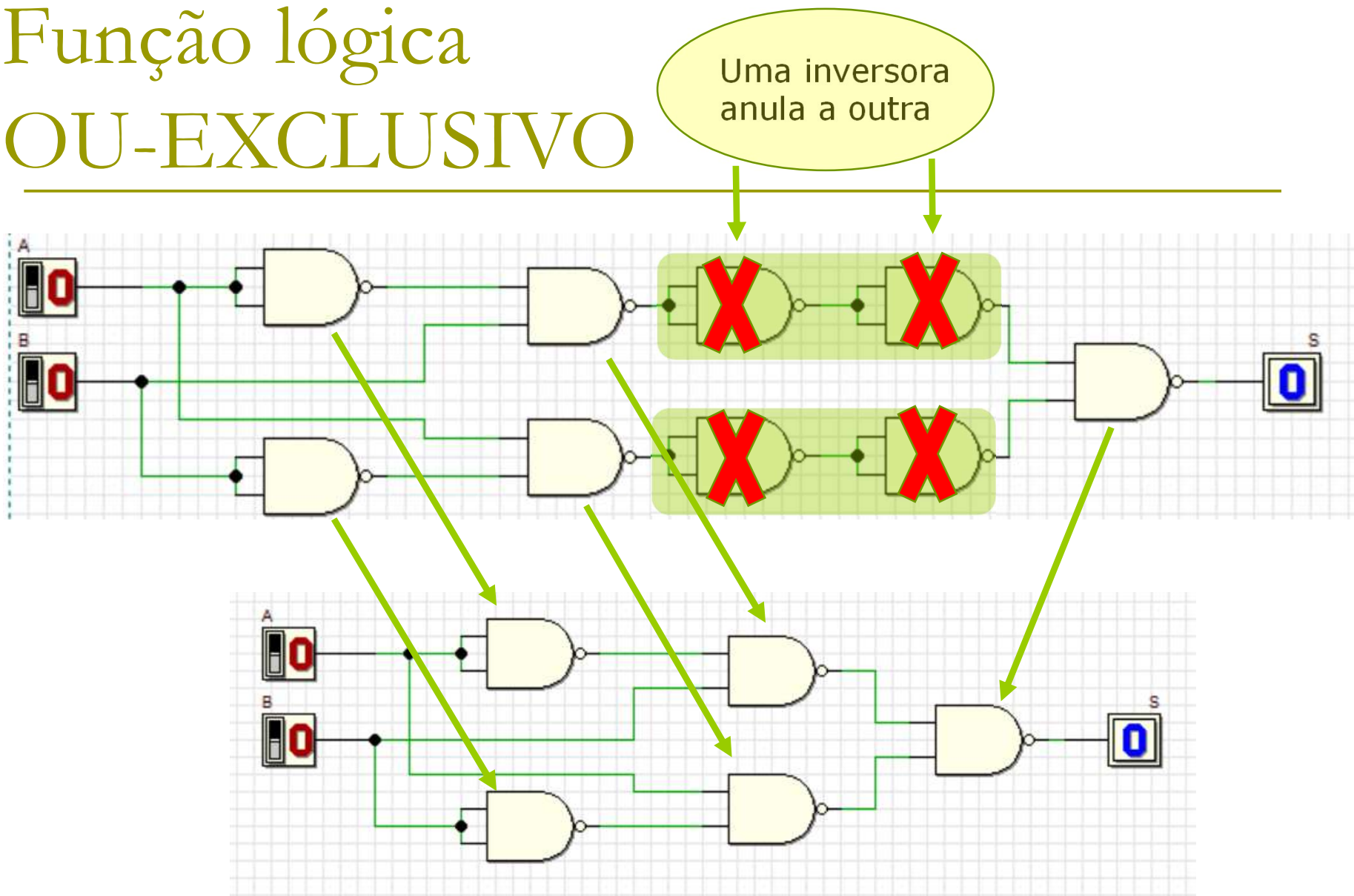
Como fazer a ou-exclusivo utilizando somente portas NAND.



Função lógica OU-EXCLUSIVO

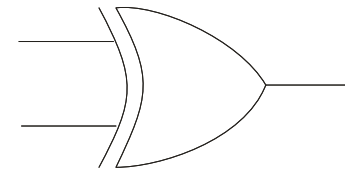
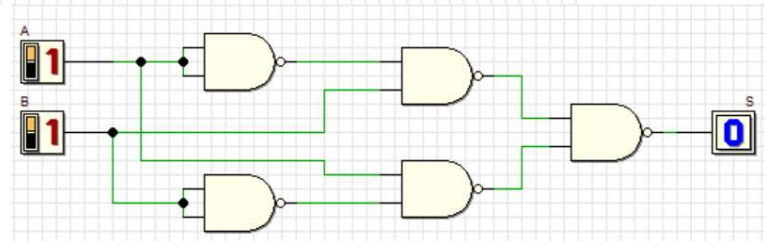
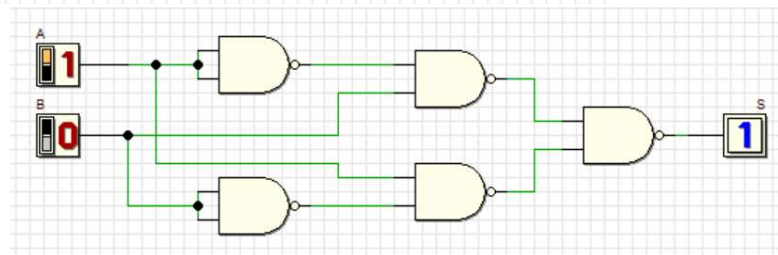
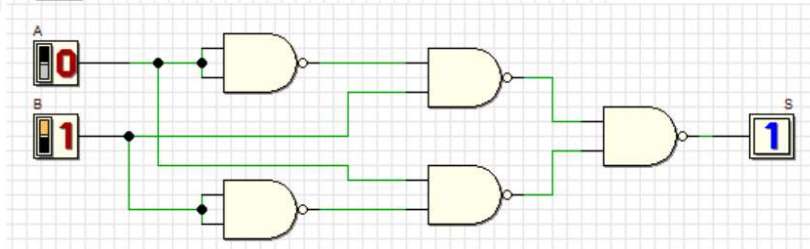
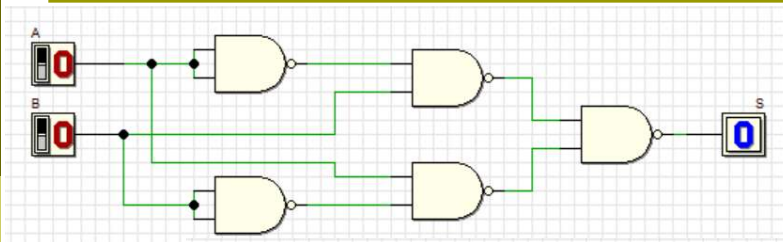


Função lógica OU-EXCLUSIVO



Ou-exclusivo utilizando somente portas NAND

Função lógica OU-EXCLUSIVO

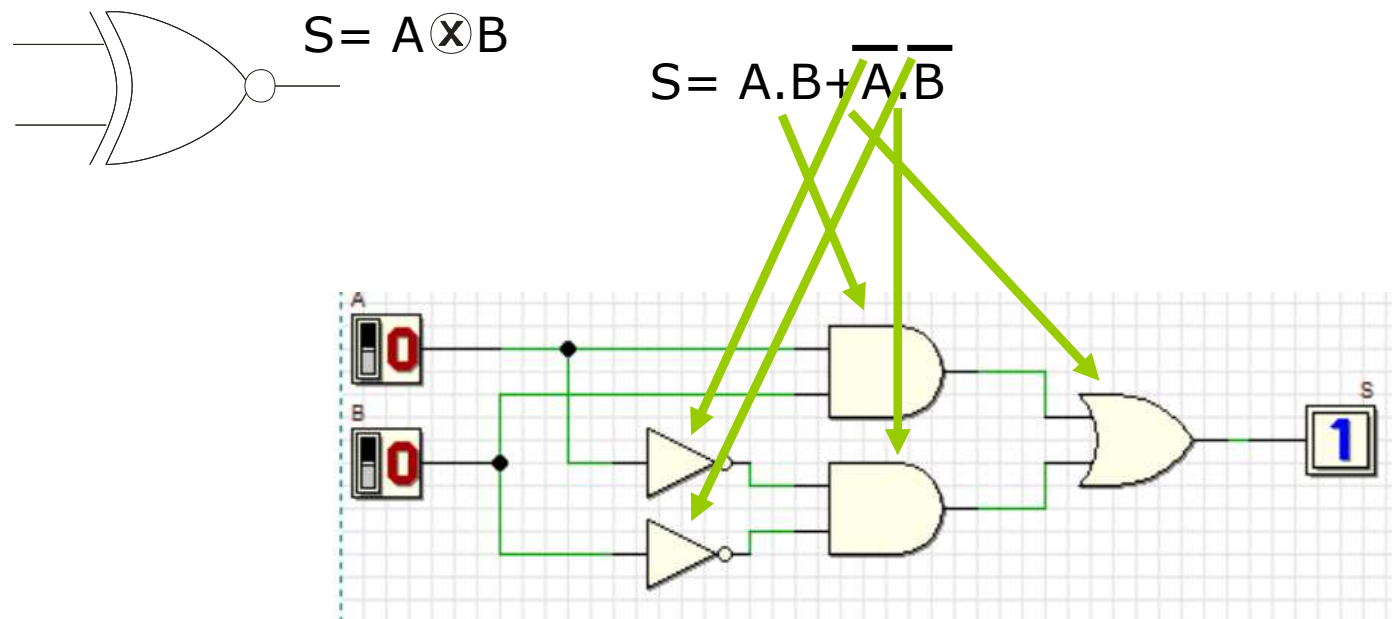


A	B	S
0	0	0
0	1	1
1	0	1
1	1	0

Função lógica NÃO OU EXCLUSIVO

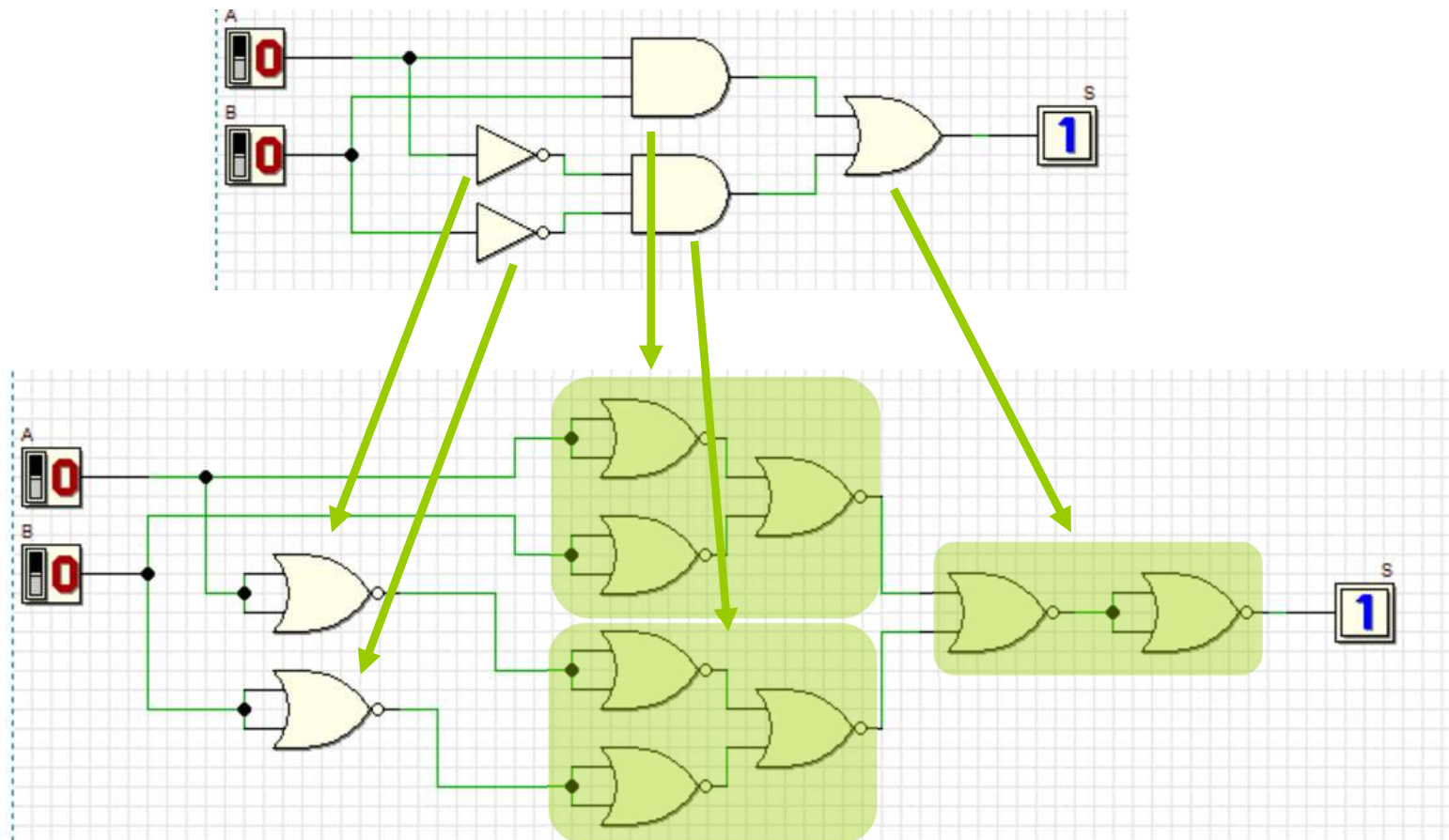
“Coincidência”

Como fazer a função EXNOR somente com portas NOR



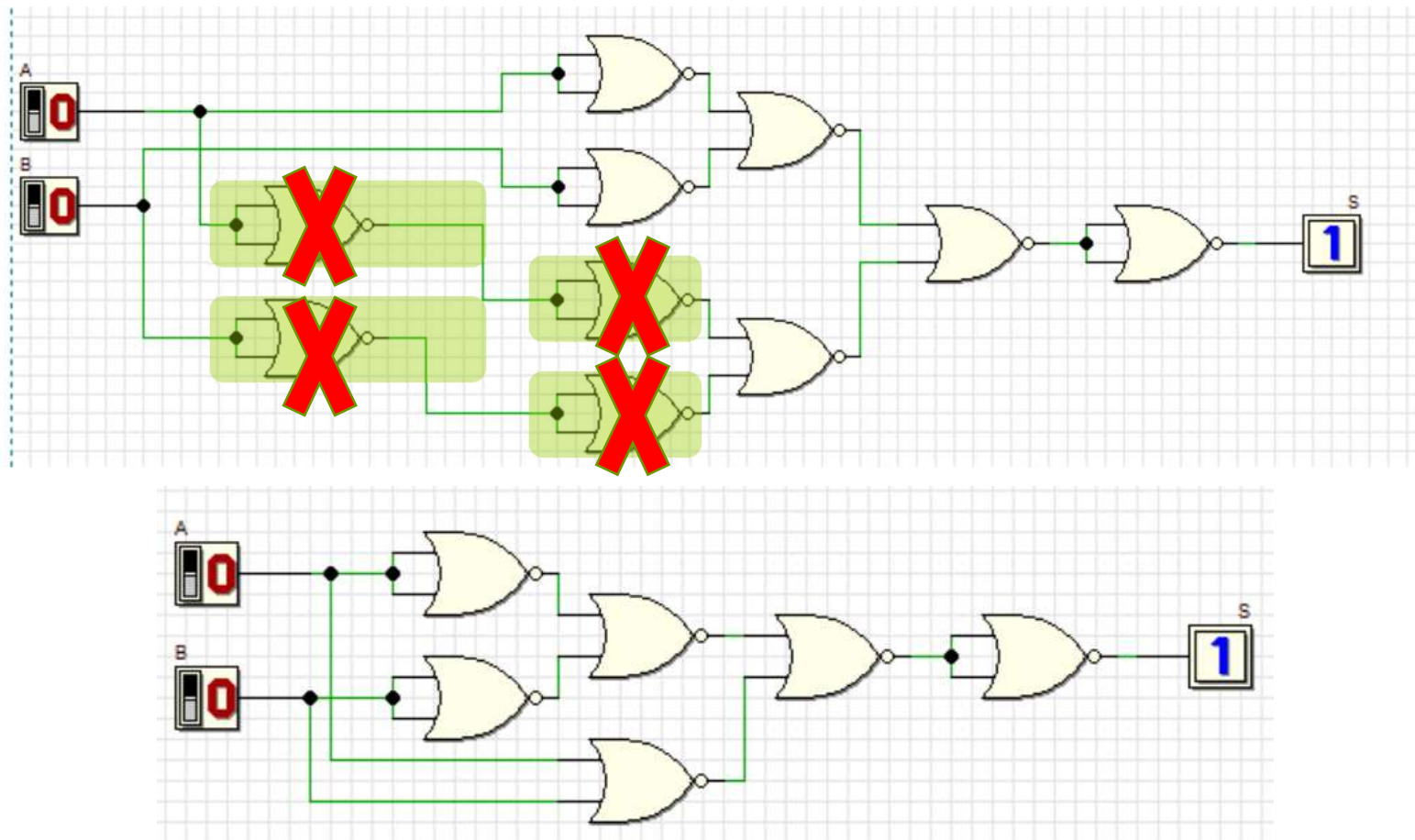
Função lógica NÃO OU EXCLUSIVO

“Coincidência”



Função lógica NÃO OU EXCLUSIVO

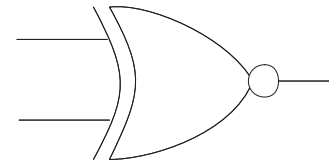
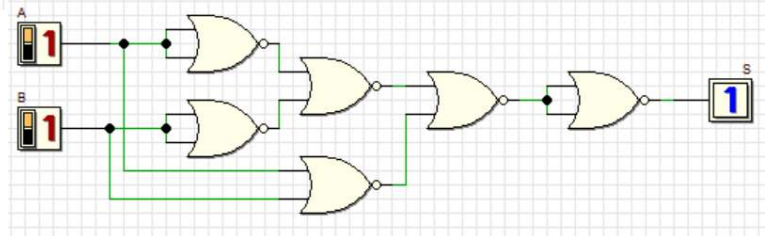
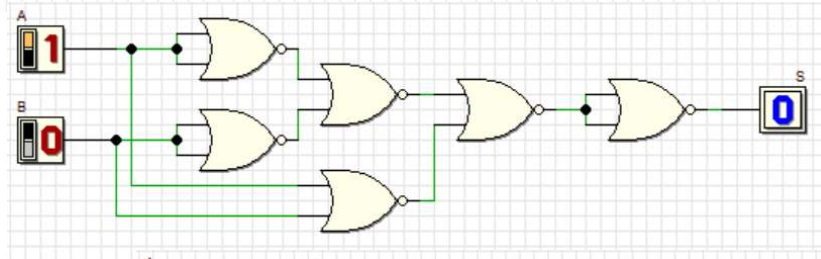
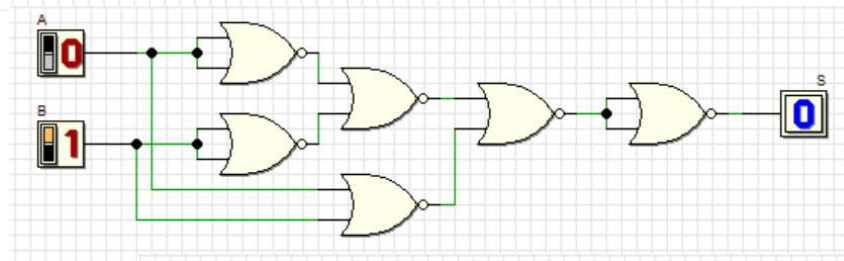
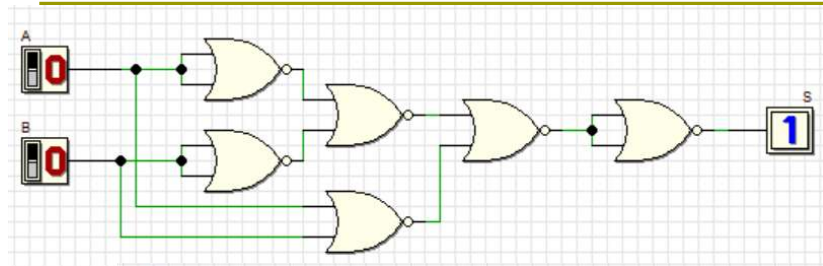
“Coincidência”



Como fazer a não-ou-exclusivo utilizando somente portas NOR.

Função lógica NÃO OU EXCLUSIVO

“Coincidência”



A	B	S
0	0	1
0	1	0
1	0	0
1	1	1