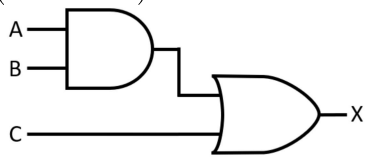
CS-150 Worksheet 3
Gates and Circuits

This worksheet is about getting familiar with logic gates and circuits.

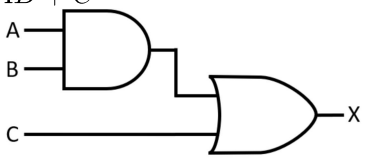
☐ Task 3.1 – Circuit Diagrams

- Draw the following circuit diagrams (note there are different notations!):

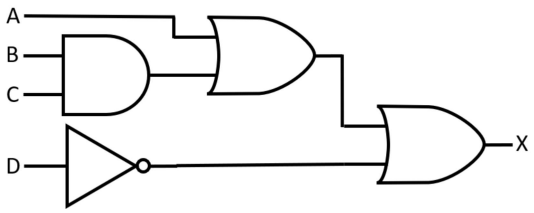
i. (A AND B) OR C



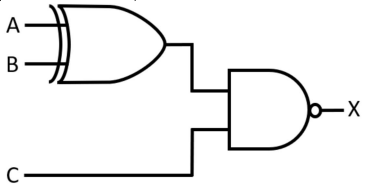
ii. $AB + C$



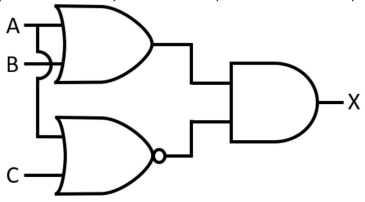
iii. $(A + BC) + D'$



iv. (A XOR B) NAND C



v. (A OR B) AND (C NOR A)



☐ Task 3.2 – Truth Tables

- Write the truth table for each of the above expressions.

i. (A AND B) OR C			
A	B	C	Output
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

ii. $AB + C$			
A	B	C	Output
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

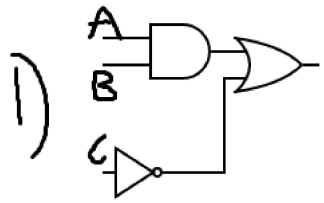
iii. $(A + BC) + D'$				
A	B	C	D	Output
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

iv. (A XOR B) NAND C			
A	B	C	Output
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

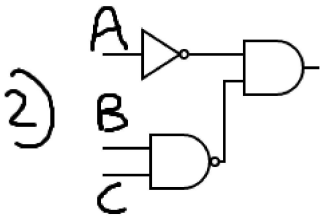
v. (A OR B) AND (C NOR A)			
A	B	C	Output
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

☐ Task 3.3 – Boolean Expressions

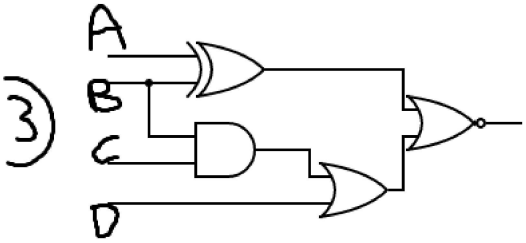
- Give the boolean expressions for each of the following:



3 possible solutions:
A AND B OR NOT C
$A \cdot B + C'$
$AB + \neg C$



3 possible solutions:
NOT A AND (B NAND C)
$A' \cdot (B \cdot C)'$
$\neg A \neg (BC)$



3 possible solutions:
(A XOR B) NOR ((B AND C) OR D)
$((A \oplus B) + (B \cdot C + D))'$
$\neg((A \oplus B) + (BC + D))$