

Foundations of Information Systems

Winter Semester 2024–25, Exercise 2

For discussion on Wednesday, October 30, 2024

1. Prove the following statements, referring to the axioms of Boolean algebra and, if applicable, elementary theorems from class:

(a) $(a \wedge b) \vee (a \wedge b') = a$

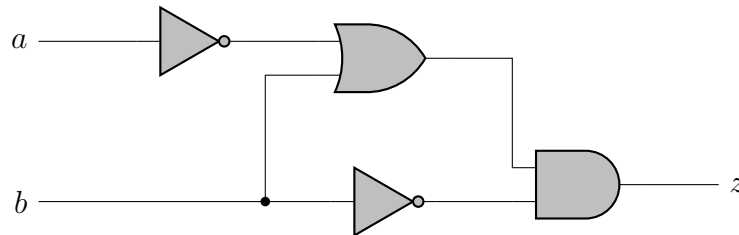
(b) $(a \wedge b') \vee b = a \vee b$

(c) $(a \vee b) \wedge (b \vee c) \wedge (a' \vee c) = (a \vee b) \wedge (a' \vee c)$

2. Derive and simplify a Boolean algebra expression for the following binary truth table:

a	b	c	z
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

3. (a) Convert the following circuit diagram into a Boolean expression and simplify, if possible:



- (b) Draw a circuit diagram implementing the following Boolean expression:

$$z = (a \wedge b' \wedge c) \vee (a' \wedge b) \vee (a \wedge c)'$$

4. Perform the following conversion to different number systems:

(a) $(DC)_{16} = (\dots)_2 = (\dots)_{10}$

(b) $(110101)_2 = (\dots)_{10} = (\dots)_{16}$

(c) $(1000)_{10} = (\dots)_2 = (\dots)_{16}$