Computer Structure - Spring 2004

Assignment No. 1

Course site: http://hyde.eng.tau.ac.il/Computer_Structure04

Firm Deadline: March 11 - before the beginning of the lecture

1. Let $B = \{0, 1, 2, 3\}$, and let $\mathcal{A} = (B, \max, \min)$. Is $\mathcal{A}$ a boolean algebra? If so prove it is, if not what axioms does $\mathcal{A}$ not fulfill.

2. Let $\mathcal{A} = (B, +, \cdot)$ be a boolean algebra, and let $a, b \in B$. Prove the following:

   - $(a')' = a$.
   - $a + (a \cdot b) = a$.
   - $a \cdot (a + b) = a$.

3. Prove the associativity of the binary operators of boolean algebra, i.e., for every $a, b, c \in B$ the following holds:

   - $a + (b + c) = (a + b) + c$.
   - $a \cdot (b \cdot c) = (a \cdot b) \cdot c$.

   Hint: Prove that both sides equal to $((a + b) + c) \cdot (a + (b + c))$.

4. Prove DeMorgan's laws:

   - $(a + b)' = a' \cdot b'$.
   - $(a \cdot b)' = a' + b'$.

5. Answer Question 1.5 in the Lecture Notes.