CS 210 Multiple Choice Quiz 2

Alex Vondrak

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1. Which line is wrong in the following truth table?

	a	b	$(((b \cdot (a')') \cdot ((b + (b + a)) + a')) \cdot b)$
A	0	0	0
B	0	1	1
C	1	0	0
D	1	1	1

2. In general, Boolean operators may have many similarities with all sorts of more familiar functions from "normal" algebra.
Which of the following correctly characterizes the behaviors of `AND` and `OR`?

   A $x \cdot y = \min(x, y)$; $x + y = \max(x, y)$

   B $x \cdot y = \max(x, y)$; $x + y = \min(x, y)$

   C $x \cdot y = x \mod y$; $x + y = x^y$

   D $x \cdot y = x^y$; $x + y = x \mod y$

3. Which of the following best describes the behavior of `XOR`?

   A $x \oplus y$ is similar to $(x + y)$ in "normal" algebra

   B $x \oplus y$ is similar to $(x - y)$ in "normal" algebra

   C $x \oplus y$ is similar to $x \neq y$

   D All of the above

4. We've said that Boolean algebra has a property of *duality*, whereby an equation $e_1 = e_2$ will have the same truth value when we take the *dual* of expressions e_1 and e_2. That is, we interchange $\cdot$s and $+$s along with `1`s and `0`s.
However, suppose we had the "field" definition of Boolean algebra, which instead uses $\cdot$ and $\oplus$. Does duality hold if we instead interchange $\cdot$s with $\oplus$s?

   A Yes, the duality of `AND`/`OR` guarantees the duality of `AND`/`XOR`

   B Yes, any pair of distinct binary operators in Boolean algebra are dual to each other

   C No, because fields can't have duality

   D No, `AND` and `XOR` do not happen to work that way together

5. Which of the following equations is true?

   A $((a + b) + (a + b')(a + b)')((a + b) + (a + b')(a + b)')' = (a' + b')$

   B $((a + b) + (a + b')(a + b)')(a' + b') = ((a + b) + (a + b')(a + b)')'$

   C $(a + b)((a + b) + (a + b')(a + b)') = (a + b)$

   D None of the above

6. We say that op_1 *distributes over* op_2 if $x \text{ op}_1 (y \text{ op}_2 z) = (x \text{ op}_1 y) \text{ op}_2 (x \text{ op}_1 z)$.
What can we say about the `AND` and `XOR` operators of of Boolean algebra?

   A `AND` distributes over `XOR`

   B `XOR` distributes over `AND`

   C Both of the above

   D None of the above