Boolean Algebra Worksheet

Instructions

Use Java boolean notation: `&&` (AND), `||` (OR), `!` (NOT) Variables: A, B, C, D represent boolean values (true or false)

Part 1: Apply DeMorgan's Laws

Simplify the following expressions using DeMorgan's laws:

1. `!(A && B)`
2. `!(A || B)`
3. `!(A && B && C)`
4. `!(!A || B)`
5. `!(A || !B) && C`
6. `!((A && B) || C)`
7. `!(A && (B || C)) || D`
8. `!((A || B) && (C || D))`

Part 2: Identity Verification

Determine whether each identity is **TRUE** or **FALSE**. Show your work using boolean simplification rules:

1. `A && (B || C) = (A && B) || (A && C)`
2. `A || (A && B) = A`
3. `(A || B) && (A || C) = A || (B && C)`
4. `(A || B) && (!A || B) = B`
5. `A && (B || C) && (B || !C) = A && B`
6. `(A && B) || (A && C) || (!A && B && C) = (A && B) || (A && C)`

Part 3: Simplify the Following

Reduce each expression to its simplest form:

1. `A && A`
2. `(A || B) && (!A || B)`
3. `A && (B || !B)`
4. `(A && B) || (A && !B) || (!A && C)`
5. `(A || B) && (A || C) && (B || C)`
6. `(A && B && C) || (A && B && !C) || (A && !B && C) || (!A && B && C)`
