In More Depth: DeMorgan's Theorems

In addition to the basic laws we discussed on pages B-4 and B-5, there are two important theorems, called DeMorgan's theorems:

$$\overline{A+B} = \overline{A}\cdot\overline{B} \quad \text{and} \quad \overline{A\cdot B} = \overline{A}+\overline{B}$$

B.1 [10] <§B.2> Prove DeMorgan's theorems with a truth table of the form

A	B	$\overline{A}$	$\overline{B}$	$\overline{A+B}$	$\overline{A}\cdot\overline{B}$	$\overline{A\cdot B}$	$\overline{A}+\overline{B}$
0	0	1	1	1	1	1	1
0	1	1	0	0	0	1	1
1	0	0	1	0	0	1	1
1	1	0	0	0	0	0	0

B.2 [15] <§B.2> Prove that the two equations for *E* in the example starting on page B-6 are equivalent by using DeMorgan's theorems and the axioms shown on page B-6.

B.15 [15] <§§B.2, B.3> Derive the product-of-sums representation for *E* shown on page B-11 starting with the sum-of-products representation. You will need to use DeMorgan's theorems.

B.16 [30] <§§B.2, B.3> Give an algorithm for constructing the sum-of-products representation for an arbitrary logic equation consisting of AND, OR, and NOT. The algorithm should be recursive and should not construct the truth table in the process.