SYSTEMS I — PROBLEM SET 1
Combinational logic and circuits

1. Use Karnaugh maps to simplify the logic functions described by the truth tables below. You do **not** need to draw the corresponding circuit—a boolean algebraic expression for the output is sufficient. Note that A, B, C, and D are inputs, while Y is the output.

(a)

A	B	C	Y
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

(b)

A	B	C	D	Y
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	0
1	1	1	1	1

2. Convert the following formula from disjunctive normal form (sum-of-products) to conjunctive normal form (product-of-sums):

$$\bar{A}\bar{B}C + A\bar{B}\bar{C}$$

3. Using **only algebraic manipulation**, show that the following two boolean expressions are equivalent:

   (a) $\bar{A}B + \bar{A}C$
   (b) $\bar{A}B + \bar{A}\bar{B}C$

This assignment is due on Friday, September 19, at 11:00 am