Homework #5
Due Tu. 10/10

Note: Do not use a calculator or computer to complete the following exercises. You must show all your work and put a box around your final answer to receive credit. Messy or unreadable submissions will receive no credit.

Homework will only be accepted at the beginning of class and all pages must be stapled together.

Total Points: 65

1. (0 points) How long did it take you to complete the homework? This will not affect your grade (unless omitted) but it helps gauge the workload for this and future semesters. If you do not answer this question you will get -5 points.

2. (15 points) Use factoring to write the following expressions in canonical POS form.
   (a) (5 points) $Y_1 = B$. Assume the output is a function of 2 inputs A, B.
   (b) (5 points) $Y_2 = B$. Assume the output is a function of 3 inputs A, B, C.
   (c) (5 points) $Y_3 = AB + C$. Assume the output is a function of 3 inputs A, B, C.

3. (10 points) Simplify the following expression. Show your work and list which Axiom or Theorem you used in each step. The final equation should be in minimized SOP form.
$$Y = (A + \overline{B})(\overline{A} + \overline{B} + D)(\overline{B} + C + \overline{D}).$$

4. (15 points) Sketch the two-level schematic using a minimum number of gates (without Boolean simplification) for the following SOP equation
$$Y = \overline{A}B\overline{C} + A\overline{B}\overline{C} + AB\overline{C} + ABC.$$
   (a) (5 points) Sketch using only AND, OR, and NOT gates.
   (b) (5 points) Sketch using only NAND and NOT gates.
   (c) (5 points) Sketch using only NAND gates.

5. (10 points) Sketch the two-level schematic using a minimum number of NOR gates (without Boolean simplification) for the following equation
$$Y = (A + B + C)(A + B + \overline{C})(A + \overline{B} + \overline{C})(\overline{A} + B + \overline{C}).$$

6. (15 points) Use a Karnaugh map to minimize the following functions. Assume Y is the output and all other variables are inputs and express your final answer in minimized SOP form.
   (a) (5 points)

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

(b) (5 points)

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

(c) (5 points)

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