1: Identify each of these logic gates by name, and complete the tables



- 2. For the following Boolean expressions:
  - a. Construct the truth table
  - b. Write the Verilog expression
  - c. Simplify if possible
  - d. Draw the equivalent circuit in gates

 $AB + A\overline{B}$ 

$$A\overline{B} + \overline{A}B$$

 $ABC + \overline{A}B\overline{C} + AB\overline{C}$ 

- 3. For the following circuit:
  - a. Construct the truth table
  - b. Construct the Boolean expression, starting with the SoP, then simplifying
  - c. Write the Verilog expression



- 4. For the following 3 truth tables:
  - a. Construct the SoP Boolean expression and simplify
  - b. Write the Verilog expression
  - c. Draw the circuit in gates

A	В	С	Output		Α	В	С	Output	Α	В	С	Output
0	0	0	0	1	0	0	0	0	0	0	0	0
0	0	1	0	1	0	0	1	1	0	0	1	0
0	1	0	0	1	0	1	0	1	0	1	0	1
0	1	1	0	1	0	1	1	0	0	1	1	0
1	0	0	0	1	1	0	0	0	1	0	0	0
1	0	1	1	1	1	0	1	0	1	0	1	0
1	1	0	0		1	1	0	0	1	1	0	1
1	1	1	0		1	1	1	0	1	1	1	0

5. For the following truth table, design the circuit with the fewest possible gates.

Α	В	С	Output
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

6. For the following PoS expressions, simplify and draw the resultant circuits:

$$(A+B)(\overline{A}+\overline{B}) (A+\overline{B}) (A$$

$$(A+B+C)(\overline{A}+B+\overline{C})(A+B+\overline{C}) \qquad (A+\overline{B}+C)(\overline{A}+B+\overline{C})(A+B+\overline{C})$$

7. The following truth table describes a NAND gate:

Α	В	Output
0	0	1
0	1	1
1	0	1
1	1	0

Write the SoP and PoS expressions separately and compare. When you've completed that, you will see why sometimes PoS is better. For the next 2 truth tables, do the same: write the SoP and PoS expressions, and use Demorgan's theorem to show that they are equivalent. Simplify and draw the circuit in gates.

Α	В	С	Output
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

Α	В	С	Output
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

- 8. A seven segment decoder is a digital circuit designed to drive a very common type of digital display device: a set of LED or LCD segments that render the numerals 0 through 9 at the command of a four-bit code:
  - a. Why a 4-bit code? Would a 3-bit code do?
  - b. Write the truth table that describes the logic needed to turn the bit code into the corresponding display number, assuming that a "1" means the segment is "lit"



- c. Write the Boolean equation for each of the 7 outputs using either SoP or PoS, your choice, and simplify.d. Draw the corresponding circuits.