Palomar College
Computer Science &
Information Technology
CSCI 112 Programming Fundamentals I
Homework 5

**For Exercises 1 - 12, match the gate with the diagram or description of the operation.**
A. AND
B. NAND
C. XOR
D. OR
E. NOR
F. NOT

1. Inverts its input. _NOT_

2. Produces a 1 only if all its inputs are 1 and a 0 otherwise. ~~NOT~~ _AND_

3. Produces a 0 only if all its inputs are 0 and a 1 otherwise. _OR_

4. Produces a 0 only of its inputs are the same and a 1 otherwise. _XOR_

5. Produces a 0 of all its inputs are all 1 and a 1 otherwise. _NAND_

6. Produces a 1 if all its inputs are 0 and a 0 otherwise. _NOR_

7. _NOT_

8. _AND_

9. _OR_

10. _XOR_

11. _NAND_

12. _NOR_
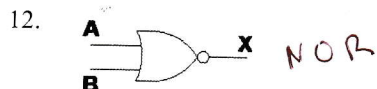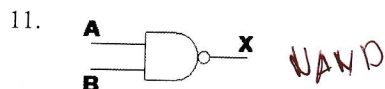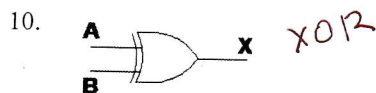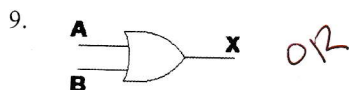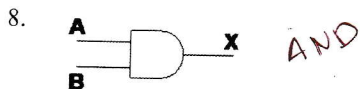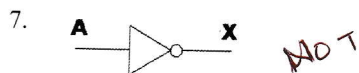
13. What are the three notational methods for describing the behavior of gates and circuits?

booleans, logic diagrams, and truth tables

14. Name six types of gates.

NOT, AND, OR, XOR, NAND, NOR

15. Give the three representations of a NOT gate and say in words what NOT means.

$$X = A'$$

A	X
0	1
1	0

How its represented in code

logic diagram to represent the expression

what inputs will and won't work

16. Give the three representations of an AND gate and say in words what AND means.

$$X = A \cdot B$$

how its represented in code

logic diagram to represent the expression

A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

what inputs will and won't work

17. Give the three representations of an OR gate and say in words what OR means.

$$X = A + B$$

A	B	X
0	0	0
0	1	1
1	0	1
1	1	0

18. Give the three representations of an XOR gate and say in words what XOR means.

$$X = A \oplus B$$

A	B	X
0	0	0
0	1	1
1	0	1
1	1	0

19. Give the three representations of a NAND gate and say in words what NAND means.
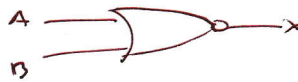
$$X = (A \cdot B)'$$

A	B	X
0	0	1
0	1	1
1	0	1
1	1	0

20. Give the three representations of a NOR gate and say in words what NOR means.

$$X = (A + B)'$$

A	B	x
0	0	1
0	1	0
1	0	0
1	1	0

21. Compare and contrast the AND gate and the NOR gate.

the outputs are reversed

AND 0 0 0 1   NOR 1 0 0 0

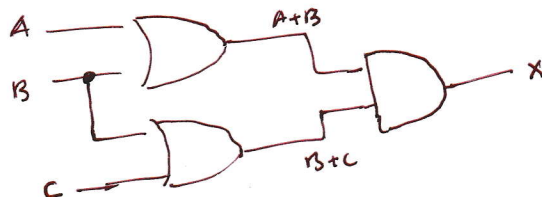22. Draw and label the symbol for a three input AND gate, then show its behavior with a truth table.

A	B	C	x
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

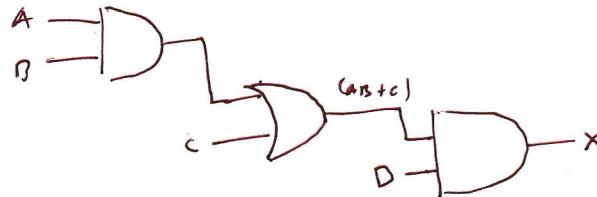23. Draw and label the symbol for a three-input OR gate, then show its behavior with a truth table.

A	B	C	x
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

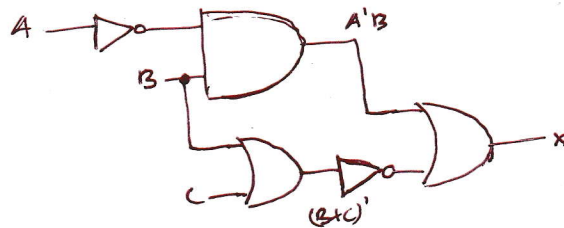24. Draw a circuit diagram corresponding to the following Boolean expression:
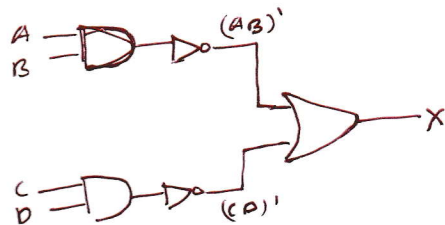   (A + B)(B + C)

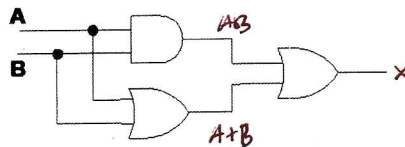25. Draw a circuit diagram corresponding to the following Boolean expression:
(AB + C)D

26. Draw a circuit diagram corresponding to the following Boolean expression:
A'B + (B+C)'

27. Draw a circuit diagram corresponding to the following Boolean expression:
(AB)' + (CD)'

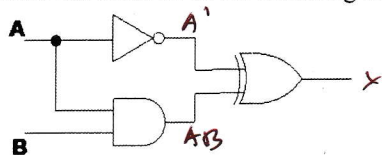

28. Show the behavior of the following circuit with a truth table:

A	B	AB	A+B	X
0	0	0	0	0
0	1	0	1	1
1	0	0	1	1
1	1	1	1	1

29. Show the behavior of the following circuit with a truth table:

A	B	A'	AB	X
0	0	1	0	0
0	1	1	0	1
1	0	0	0	1
1	1	0	1	0

30. Show the behavior of the following circuit with a truth table:

A	B	C	A'	B⊕C	X
0	0	0	1	0	0
0	0	1	1	1	1
0	1	0	1	1	1
0	1	1	1	0	0
1	0	0	0	0	0
1	0	1	0	1	0
1	1	0	0	1	0
1	1	1	0	0	0

31. Show the behavior of the following circuit with a truth table:
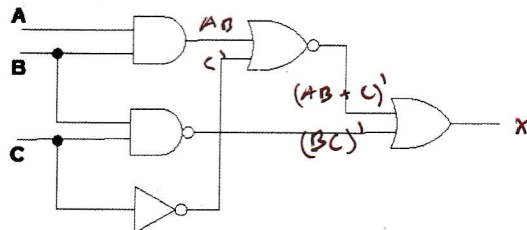
A	B	C	AB	C'	(AB+C)'	(BC)	X	X
0	0	0	0	1	1	1	0	1
0	0	1	0	0	0	1	1	1
0	1	0	0	1	1	1	1	1
0	1	1	0	0	0	1	1	1
1	0	0	0	1	1	1	1	0
1	0	1	0	0	0	1	1	1
1	1	0	1	1	0	1	1	1
1	1	1	1	0	0	0	0	0

32. Name six properties of Boolean algebra and explain what each means.

Commutative : $AB = BA$ it equals itself

Associative : $(AB)C = A(BC)$ it equals itself muliplacation

Bistributive : $A(B+C) = (AB)+(AC)$ Factoring is possiable

Identity : $A1 = A$ mutiplied or added to itself equals itself

Complement: $(A)A' = 0$ $A + A' = 0$ works like regular multiplication or addition