LW: Boolean Logic

**A grade of "complete" on this lab work requires a score of at least 90%.**

# Tasks ([Work on the lab on Mimir](https://class.mimir.io/assignments/76e0863f-e205-43e2-87d7-e1c3477a5b49))

1. [5 points] Print the truth table for NOT
2. [5 points] Print the truth table for OR
3. [5 points] Print the truth table for AND
4. [5 points] Print the truth table for XOR
5. [16 points] Compute x OR y OR z, given an assignment of truth values
6. [16 points] Compute x AND y AND z, given an assignment of truth values
7. [16 points] Compute x XOR y XOR z, given an assignment of truth values
8. [16 points] Compute f(x, y, z) given an assignment of truth values and the truth table

x | y | z | f

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0 | 0 | 0 | 0

0 | 0 | 1 | 1

0 | 1 | 0 | 1

0 | 1 | 1 | 1

1 | 0 | 0 | 1

1 | 0 | 1 | 0

1 | 1 | 0 | 0

1 | 1 | 1 | 1

One way to do this is to identify the rows of the table where f(x,y,z) is true. Then express the assignment of truth values as a boolean formula (e.g. (x,y,z) = (1,0,1) is expressed “x AND NOT y AND z”). The disjunction (OR) of all of those formulas will be a formula for f.

Another way to do it is to do the same thing for all the rows where f is false, combine them into one big disjunction, then take the negation (NOT) of the whole formula to obtain a formula for f.

A third way is to stare really hard at the table and crush the problem in your mind-vice to produce a succinct and elegant formula. This method is not recommended for novice logicians.

1. [16 points] Find an assignment to the boolean variables w,x,y,z that satisfies the boolean formula

x AND (w OR y) AND (NOT w OR NOT z) AND (NOT y or z)

Crush it in your mind-vice: assign a truth value to one variable at a time and reduce the set of possible values of the rest until only 1 or 2 possibilities remain.