CS 173 Discussion 1: Propositional Logic

Date: August 29/30, 2019.

Problem 1. Your class has a textbook and a final exam. Let P, Q, and R be the following propositions.

P : You get an A on the final exam.
Q : You do every exercise in the book.
R : You get an A in the class.

Translate the following assertions into propositional formulas using P, Q, R and the propositional connectives AND, NOT, IMPLIES.

1. You get an A in the class, but you do not do every exercise in the book.
2. You get an A on the final, you do every exercise in the book, and you get an A in the class.
3. To get an A in the class, it is necessary for you to get an A on the final.
4. You get an A on the final, but you don't do every exercise in the book; nevertheless, you get an A in this class.

Problem 2. Negate the following statement, moving all negations (e.g. "not") onto individual propositions.

If my plant is dead, then I didn't water it or I left it in the dark.

Construct the contrapositive of the above statement.

Problem 3. Prove by truth table that OR distributes over AND, namely,

$$P \text{ OR } (Q \text{ AND } R) \text{ is equivalent to } (P \text{ OR } Q) \text{ AND } (P \text{ OR } R)$$

Problem 4. Consider a new logical operator $\downarrow$ whose truth table is given as follows.

P	Q	$P \downarrow Q$
F	F	T
F	T	F
T	F	T
T	T	F

Express $P \downarrow Q$ in an equivalent form using only NOT, AND, and OR.