MATH 321: HOMEWORK 0
DUE THURSDAY, SEPT 1 BY 11:59PM

Problem 1. Consider the English statement "If it is low tide then I will snorkel and if it is not low tide then I will surf". Translate this sentence into a formula in propositional logic and construct a truth table for the formula.

Problem 2. Consider the logical connect $\downarrow$, called nor, given by the following truth table.

p	q	$p \downarrow q$
F	F	T
F	T	F
T	F	F
T	T	F

Show that $p \downarrow q$ is equivalent to $\neg(p \vee q)$ by constructing a truth table for the latter formula. Come up with formulae using only $\downarrow$ which are equivalent to $\neg p$, $p \vee q$, and $p \wedge q$. Verify they are equivalent by constructing their truth tables.

Problem 3. Verify the two DeMorgan's laws by constructing truth tables.

Problem 4. Find a formula using only $\neg$ and $\rightarrow$ which is equivalent to $p \leftrightarrow q$. Verify they are equivalent by constructing their truth tables.

Problem 5. Consider the two formulae

$$\neg\neg\neg(a \rightarrow (\neg\neg b \vee a)) \quad \text{and} \quad (\neg a \wedge b) \rightarrow \neg a.$$

Construct truth tables for each formula to determine whether each is a tautology, a contradiction, or neither.