MATH 321: 8-26 GROUPWORK

(1) Consider the following two English sentences. Translate each sentence into a formula of propositional logic, and then construct the truth table for each.
   - The weather is hot but it is not raining.
   - Alice will win and Barbara will not win or else Carlos will win and Barbara will win.

(2) Consider the logical connective $\uparrow$, called nand, given by the following truth table.

p	q	$p \uparrow q$
F	F	T
F	T	T
T	F	T
T	T	F

Check that $p \uparrow q$ is equivalent to $\neg(p \wedge q)$ by constructing the truth table for the latter. Find expressions just using $\uparrow$ which are equivalent to $\neg p$ and $p \wedge q$. Check they are equivalent by constructing their truth tables.

(3) A multiplexor is a circuit gate which is used to select an output from multiple inputs. Consider the simplest case, that of a 2–1 multiplexor. Each wire carries a signal of either 0 (low voltage) or 1 (high voltage). There are two input wires I_0 and I_1 and there is a selector wire S. If S is 0 then I_0 is output and if S is 1 then I_1 is output. Thinking of 0 as false and 1 as true, write a truth table which describes the output in terms of the I_0, I_1, and S. Can you write down a formula in propositional logic which gives this truth table?