MATH 321: HOMEWORK 3
DUE FRIDAY, FEB 5 BY 11:00PM

Problem 1. Use truth tables to show that the following pairs of statements are equivalent:
   (1) "P or Q" and "if not P then Q".
   (2) "P iff Q" and "if P then Q and if Q then P".

Problem 2. Prove the following version of DeMorgan's laws for sets:
   Let U be a set and A, B be subsets of U. Then $U \setminus (A \cup B) = (U \setminus A) \cap (U \setminus B)$ and $U \setminus (A \cap B) = (U \setminus A) \cup (U \setminus B)$.

Problem 3. Suppose a set U has exactly n elements, where $n > 0$ is finite: $U = \{a_1, a_2, \ldots, a_n\}$. Prove that the following pairs of statements are equivalent, where $P(x)$ is a predicate:
   (1) "$P(x)$ for all $x \in U$" and "$P(a_1)$ and $P(a_2)$ and ... and $P(a_n)$".
   (2) "There is some x in U so that $P(x)$" and "$P(a_1)$ or $P(a_2)$ or ... or $P(a_n)$".

Problem 4. Do Exercise 3.12 from the textbook. (See the top of page 23 for the definition of a square-free number.)

Problem 5. Do Exercise 3.13 from the textbook.