Math 210
Review Activity

Instructions: This is a group review activity. You may work together with one or two other classmates to answer these questions. You can use the space below, the back of this page, or your own paper to work these problems.

1. Consider the logical proposition $((p \vee q) \wedge \neg p) \rightarrow q$. Show that this expression is a tautology using:
   (a) a truth table.
   (b) a 2-column proof.

2. Suppose that we encounter three inhabitants (call them A, B and C) of an island where all inhabitants are either knights, knaves, or spies. Recall that knights always tell the truth, knaves always lie, and spies can either lie or tell the truth. Given that one person of each type is represented in this group of three, determine, is possible, the type of each person if A says: "I am the knight", B says "I am the knave", and C says: "I am the spy". Justify your answer.

3. Give an example of a predicate $P(x, y)$ such that $\exists x \forall y P(x, y)$ and $\forall y \exists x P(x, y)$ have different truth values.

4. Prove or Disprove the following for arbitrary sets A, B, and C.
   (a) $(A - B) - C = (A - C) - B$
   (b) $(A - B) - C = A - (B - C)$

5. Find a rule (either closed form or recursive) that generates the sequence: $1, 3, 4, 8, 15, 27, 50, 92, \cdots$

6. Use mathematical induction to show that $n^2 + n < 2^n$ for $n > 4$.