Math 228 **Homework 3**

Instructions: Complete the homework problems below on *separate* sheets of paper (and not all jammed up between the questions). This is to be turned in and graded, so make sure your work is neat and easy to ready - there is nothing wrong with using a separate sheet of paper for each problem. Each solution should be accompanied with supporting work or an explanation why the solution is correct. Your work will be graded on correctness as well as the clarity of your explanations.

(8pts) 1. Consider the statement: $\forall x \forall y(x - y \geq 2 \rightarrow \exists z(y < z \wedge z < x))$.

(a) Explain what this statement says in words. Is the statement true?

(b) State the contrapositive of the original statement. Do so both in words and in symbols.

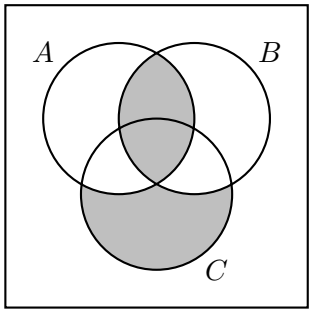
(c) State the converse of the original statement. Is the converse true?

(d) State the negation of the original statement. Do so both in words and in symbols (simplifying as much as possible).

(6pts) 2. Let A, B and C be sets. Suppose that $A \subseteq B$ and $B \subseteq C$. Does this mean that $A \subseteq C$? Explain how you know (i.e., prove your answer).

(6pts) 3. (a) Draw a Venn diagram for the set $S = \overline{A} \cup (B \cap \overline{C})$.

(b) For the Venn diagram given below, express the shaded set in terms of A, B, and C. Simplify your answer so that bars are only directly over letters.



Writing Assignment: Please turn in the following writing assignment separately from the problems above (i.e., on a separate sheet of paper, NOT stapled to the rest of the problems).

(10pts) 4. In class on Friday (February 1st) we discovered that a graph has an Euler circuit if and only if every vertex has even degree. Pick either the "if" or "only if" part of the statement and explain how we know it works. Clearly state which direction you choose to justify.