Math 228 **Homework 3** Due: Wed February 8, 2012

Instructions: Complete the homework problems below on a *separate* sheet 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. All proofs should be written out in paragraph form. Your work will be graded on correctness as well as the clarity of your explanations.

(4pts) 1. In a recent survey, 30 students reported whether they liked their potatoes Mashed, French-fried, or Twice-baked. 15 liked them mashed, 20 liked French fries, and 9 liked twice baked potatoes. Additionally, 12 students liked both mashed and fried potatoes, 5 liked French fries and twice baked potatoes, 6 liked mashed and baked, and 3 liked all three styles. How many students *hate* potatoes? Explain why your answer is correct.

(6pts) 2. Consider the set $S = \overline{A} \cup (B \cap \overline{C})$.

(a) Draw a Venn diagram for the set S.

(b) Use the Venn diagram from part (a) to draw a Venn diagram for $\overline{S}$.

(c) Use the Venn diagram from part (b) to express $\overline{S}$ in terms for A, B and C. Your answer should have bars only over single letters.

(4pts) 3. Let A, B, and C be sets. Suppose $A \subseteq B$ and $B \subseteq C$. Does this mean $A \subseteq C$? Explain why or why not.

(6pts) 4. Consider the function $f : \mathbb{Z} \to \mathbb{Z}$ defined by $f(n) = 2n + 3$.

(a) Is f one-to-one? Explain.

(b) Is f onto? Explain.

(c) Let $g : \mathbb{R} \to \mathbb{R}$ be defined by $g(x) = 2x + 3$. Is g onto? Explain.