Math 310
Project 3 Handout
Due: Tuesday, November 10th by 4:00pm

Instructions: This project is designed to give you an opportunity to explore some of the concepts from class in a little more depth. You may work with at most one other student on this assignment. If you decide to work with another student, you may turn in a combined paper with both your names listed.

1. In $(1, 2, 3) - Misère\ NIM$, the game begins with a pile of N stones. On their turn, a player can take either 1, 2, or 3 stones. However, unlike the version presented in class, in this case, the player that takes the last stone **loses** the game.

   (a) (1 point) Which player has a winning strategy if the game starts with 7 stones?

   (b) (3 points) Do a complete analysis of $(1, 2, 3) - Misère\ NIM$ as the game is defined above. That is, determine which player has a winning strategy for any value of N [Hint: split into cases].

   (c) (4 points) Generalize your results to $(1, 2, 3, ..., k) - Misère\ NIM$ in which a player can take either 1, 2, 3, ..., or k stones.

   (d) (4 points) Do a complete analysis of $(2, 3) - Misère\ NIM$ in which a player can take either 2 or 3 stones.