Math 5370 **GAME THEORY** Spring 2019
Dr. Duval **Homework**
Wednesday, January 23

Follow the separate general guidelines for Parts A,B,C. Be sure to include and label *all four* standard parts (a), (b), (c), (d) of Part A in what you hand in.

Combinatorial games; Impartial games

Beginning of Chapter 1 through Theorem 1.1.5, inclusive.

A: Reading questions. Due by 2pm, Sun., 27 Jan.

1. Play some games of Chomp (preferably with another person, but if not, try to simulate some games by yourself). List any observations you make about any strategy to win (don't worry if they are small observations).
2. Find a way to generalize Subtraction. Identify **N** and **P** for your generalized game. (If your game is too complicated to completely determine **N** and **P**, then determine as much as you can about **N** and **P**.)
3. Would the proof of Theorem 1.1.5 still work if we defined $B(x)$ to be **at least** the maximum number of moves from x to a terminal position (instead of **equal** to the maximum number)? In other words, can $B(x)$ just be **some** upper bound on the number of moves from x, or does it have to be the **least** upper bound (i.e., the maximum)? Explain why or why not.

B: Warmup exercises. For you to present in class. Due by the end of class Mon., 28 Jan.

What can you say about Chomp on a $2 \times n$ bar, for arbitrary n.

Chomp revisited; Nim

Example 1.1.6 through Remark 1.1.10, inclusive.

A: Reading questions. Due by 2pm, Tue., 29 Jan.

1. Extend Figure 1.3 to a 3×3 bar
2. Show an example of the last paragraph of the proof of Theorem 1.1.7. Why is the technique of this proof called "strategy-stealing"?
3. In the proof of Lemma 1.1.9, provide missing details to the sentence near the end of the second paragraph, "If $X \in \mathbf{P}$ and $Y \in \mathbf{N}$ ... so by the inductive hypothesis it must be in **P**.

B: Warmup exercises. For you to present in class. Due by end of class Wed., 30 Jan.

Exercises Chapter 1: 1.1.