Math 5370 | **GAME THEORY** | Spring 2019
Dr. Duval | **Homework**

Monday, January 28

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.

Bouton's solution of Nim; Other impartial games

Subsections 1.1.2 and 1.1.3.

A: Reading questions. Due by 2pm, Sun., 3 Feb.

1. At the beginning of the proof of Theorem 1.1.12, the text states that we will show two things, labeled (a) and (b). These two statements looks similar, but they have different quantifiers ((a) says "*all* moves" and (b) says "there is a move"). Explain why we need these different quantifiers.
2. Illustrate the *proof* of Theorem 1.1.12 on Nim positions (4, 3, 2, 1) and (23, 17, 11, 8).
3. Explain the second paragraph of the proof of Theorem 1.1.14.
4. Complete Exercise 1.a about Staircase Nim.

B: Warmup exercises. For you to present in class. Due by the end of class Mon., 4 Feb.

Exercises Chapter 1: 1.3.

Partisan games; Other partisan games played on graphs

Section 1.2 through the bottom of page 11; subsection 1.2.5.

A: Reading questions. Due by 2pm, Tue., 5 Feb.

1. Exercise 1.d
2. Find two other pairs of edge-disjoint trees such that each tree spans G, in Figure 1.20.
3. Carefully prove that the map $1^k 2w \mapsto 1^k 3w$ in the proof of Example 1.2.15 is a bijection.

B: Warmup exercises. For you to present in class. Due by end of class Wed., 6 Feb.

Play a complete game of Shannon's Switching Game on a 3×4 board, where Short uses the strategy described in the proof of Theorem 1.2.14 (and Cut plays reasonably well). Show each step of the game, and how Short is using the prescribed strategy.