Homework set 8

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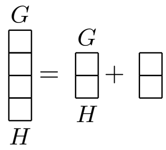
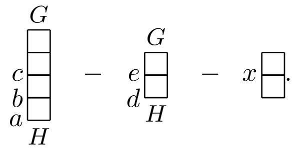
April 9, 2003
Due: April 17, 2003

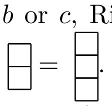
Complete the set before you leave for Easter break and slip your solutions under my office door.

1. (5 points) In my paper, *Snakes in Domineering Games,* I claimed that



Explain what is wrong with the following proof: We wish to show the second player wins the difference game



If either Left or Right play entirely in one of the G or H pieces, the 2nd player can respond in the other, leaving (by induction) 0. If Left moves at b or c, Right responds at x, leaving a position ≤ 0. If Left moves at a, Right responds at d, leaving 0 since . If Right moves at d or e, Left responds at a and b (respectively), leaving a game ≥ 0. Lastly, Right's move at x need not be considered by the number avoidance theorem.

2. (5 points) Prove that for $n \geq 2$, the canonical form of $n.\uparrow$ is $\{0 \mid (n-1).\uparrow + *\}$ and that of $n.\uparrow + *$ is $\{0 \mid (n-1).\uparrow\}$.

3. (5 points) Prove that the left and right stops of an infinitesimal are zero.

4. Prove that for any infinitesimal G born on day $n+1$, that either $G \leq n.\uparrow$ or $G \leq n.\uparrow + *$.

5. (a) What are all winning moves from a nim position consisting of three piles having sizes 5, 9 and 10. Explain.
   (b) How about four piles of sizes 4, 6, 9, 13?

6. Prove that any red-blue hackenbush position is a number.

7. (0 points) Compose a domineering problem for your portfolio.