Homework 10
Morally Due Tue April 19 at 3:30PM. Dead Cat April 21 at 3:30
WARNING: THE HW IS TWO PAGES LONG

1. (0 points) What is your name? Write it clearly. When is the take-home final due?

2. (50 points)

    (a) (0 points but some of it will help in later parts) READ my NOTES on Duplicator Spoiler games. They are on the slides website next to my slides.

    (b) (25 points) Define a Duplicator Spoiler game where the two structures are UNDIRECTED GRAPHS rather than LINEAR ORDERINGS.

    (c) (25 points) Show that, for all $n \in \mathsf{N}$, for all $k \in \mathsf{N}$, with $k < n$, there exists two graphs G, G' such that

    - G and G' have $\geq n$ vertices.
    - G has an EVEN number of vertices.
    - G' has an ODD number of vertices.
    - DUP wins the k-move Dup-Spoiler game for with (G, G').

    (HINT: Take REALLY REALLY REALLY simple graphs.)

    (d) (0 points) Redo the proof in the notes that TRUTH and GAMES are equivalent for Linear Orderings to show that TRUTH and GAMES are equivalent for graphs.

    (e) (0 points) Note that we have showed that *having an even number of vertices* is not first order definable.

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3. (a) (0 points) Read the notes with link *One Probe Search Algorithms*.

   (b) (0 points) Read the appendix of the paper by Yao, also on the website, which has the algorithm for 1-probe search with $U = 2n - 2$.

   (c) (50 points) Write up a description of the cell probe algorithm that takes only ONE probe for when $U = 2n-2$. You DO NOT have to proof that it works. And your description should be clear enough that (1) I could give it out to the class next time I teach this course, (2) someone who reads it could EASILY code it up.

   (d) (0 points) The algorithm DOES NOT tell you WHERE the item is if it is in the table. Is it possible to modify the algorithm with as few probes as possible so that it does tell you this.

   (e) (Extra Credit–This might be open) Find some reasonable $f(n)$ such that with TWO probes there is an algorithm for $U = f(n)$.