

Problem Set 7

Due: Monday, October 30, 2023 at noon

Problem 7.1 [Graph Runner: Catching Games].

Graph Runner is a two-player game played on a directed graph $G = (V, E)$. Player 1 has a token, starting at a given vertex $s \in V$. During Player 1's turn, they can move the token along an outgoing directed edge to an adjacent vertex, and gain 1 point; if they cannot move, the game ends. During Player 2's turn, they can delete an outgoing edge from the node the token is currently on. Player 1's goal is to maximize their score, while Player 2's goal is to minimize it. Prove that it is PSPACE-complete to determine, given (G, s, k) , whether Player 1 can achieve a score of at least k .

You must include a drawing or diagram in your submission.