Bouncing Ball Problem (10 Points)

Problem Statement

In this exercise, we will analyze the following scenario: A ball is held at a height of 1 meter above the ground and is released. After each bounce, the ball's speed decreases by a factor of 0.9.

(a) Derive a formula for the speed of the ball immediately after the n-th bounce. Express your result in terms of the initial height and the given reduction factor. (2 points)

(b) Determine an analytical expression for the maximum height reached by the ball after the n-th bounce. (2 points)

(c) Compute a formula for the total time elapsed from the moment the ball is released until it makes its $(n+1)$-th impact with the ground. (3 points)

(d) Represent the above quantities graphically as functions of the number of bounces. Provide a brief discussion of the results. (3 points)

Deadline: February 20, 2025.