Exercise 1 Solve the problem

\[
\max_{u_t} \sum_{t=0}^{T} \left[ x_t - u_t^2 \right], \quad x_{t+1} = 2(x_t + u_t) \quad \text{for } t = 0, \ldots, T - 1, \quad x_0 = 0
\]

Exercise 2 Suppose a consumer with a Cobb Douglas function

\[ u(x, y) = x^\alpha y^\beta \]

has an income stream \( y_0, \ldots, y_T > 0 \) and interest rates are \( r_1, \ldots, r_T \geq 0 \). For prices \( p_x^t \) and \( p_y^t \) and discount rate \( 0 < \beta < 1 \) find the optimal consumption stream of the consumer.