PROBLEM:

A linear time-invariant system is described by the difference equation

$$y[n] = x[n] - \alpha x[n-1]$$

(a) When the input to this system is

$$x[n] = \begin{cases} 0 & n < 0 \\ \alpha^n & n = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 \\ 0 & n \geq 10 \end{cases}$$

Use convolution to compute the values of $y[n]$, over the range $0 \leq n \leq 10$. Give a general formula in terms of α, and also show that most of the output values are equal to zero.

(b) Use the results from the previous part and plot both $x[n]$ and $y[n]$ for the case where $\alpha = 0.8$.