Assignment 2

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1 Problem 2 - Oppenheimer 2.39.a

Consider a system with input x[n] and output y[n]. The input-output relation for the system is defined by the following 2 properties:
1. y[n] - ay[n-1] = x[n]
2. y[0] = 1
Determine whether the system is time invariant.

2 Solution

For $x_1[n] = \delta[n]$,

$$y_1[0] = 1 \tag{2.0.1}$$

$$y_1[1] = ay[0] = a \tag{2.0.2}$$

For $x_2[n] = \delta[n-1]$,

$$y_2[0] = 1 \tag{2.0.3}$$

$$y_2[1] = ay[0] + x_2[1] = a + 1 \neq y_1[0] \tag{2.0.4}$$

Even though $x_2[n] = x_1[n-1]$, $y_2[n] \neq y_2[n-1]$. Hence, the system is TIME VARIANT.