ECE 310 Recitation 2

Concept Check

1. LSI System
   a) Linearity
   $$\mathcal{H}\{a_1x_1[n] + a_2x_2[n]\} = a_1\mathcal{H}\{x_1[n]\} + a_2\mathcal{H}\{x_2[n]\}$$
   b) Time invariance / Shift invariance
   $$y[n] = \mathcal{H}\{x[n]\} \Rightarrow y[n - n_0] = \mathcal{H}\{x[n - n_0]\}$$
   c) Causality: System output does not depend on future input.
2. Convolution
   $$y[n] = h[n] * x[n]$$

Exercise:

- LSI system

	Linear	**Shift-invariance**	**Causal**
$\mathbf{y[n] = \cos(n + 10)\, x[n]}$			
$\mathbf{y[n] + \frac{1}{2}y[n-1] = x^2[n]}$			
$\mathbf{y[n] = x[n]x[n-1]}$			

- Convolution

Example 2.6

Compute the output $y[n]$ of a linear time-invariant system when the input $x[n]$ and the impulse response $h[n]$ are given by

$$x[n] = \begin{cases} 1, & 0 \le n \le N-1 \\ 0, & \text{otherwise} \end{cases} \quad \text{and} \quad h[n] = \begin{cases} a^n, & 0 \le n \le M-1 \\ 0, & \text{otherwise} \end{cases} \tag{2.64}$$