Test I Review

EE 5350

Problem 1: A system is defined by
\[ y[n] = x^2[n] - x[n-1]x[n+1]. \]
Prove or disprove if the system is
(a) linear
(b) time invariant
(c) causal
(d) BIBO stable

Problem 2: Let \( y[n] = h[n] \star x[n] \), where \( h[n] \) and \( x[n] \) are right-sided sequences. Show that
\[ \sum_{n=-\infty}^{\infty} y[n] = \left( \sum_{n=-\infty}^{\infty} h[n] \right) \left( \sum_{n=-\infty}^{\infty} x[n] \right) \]

Problem 3: An LTI system is defined in time domain as
\[ h[n] = n \left( \frac{1}{2} \right)^n u[n]. \]
(a) Compute the frequency response \( H(e^{j\omega}) \).
(b) Let \( G(e^{j\omega}) \) be the frequency response of another system with \( G(e^{j\omega}) = H(e^{j3\omega}) \). Determine the impulse response of this system \( g[n] \).