Problems to Hand In:

**Problem 1.** Determine the ROC for the following discrete-time signal:

\[ x[n] = \begin{cases} 
\pi e^n & \text{if } n \geq 0 \text{ and } n \text{ is even} \\
\sin(\pi n) & \text{if } n \geq 0 \text{ and } n \text{ is odd} \\
\exp(\pi n) & \text{if } n < 0 \text{ and } -n \text{ is prime.} \\
0 & \text{if } n < 0 \text{ and } -n \text{ isn’t prime.}
\end{cases} \]

**Problem 2.** (Courtesy Dustin Boswell) Consider the unstable causal LTI system with impulse response

\[ h[n] = \begin{cases} 
(-1)^n 1/n & \text{if } n \geq 1 \\
0 & \text{if } n < 0.
\end{cases} \]

(a) Use the technique suggested in Prob. 2.49 to find a bounded input \( x[n] \) that produces an unbounded output \( y[n] \).

(b) Find a *causal* bounded input \( x[n] \) that produces an unbounded output \( y[n] \).

**Problem 3.** OW2, Problem 10.31.

**Problem 4.** OW2, Problem 6.28 (a), parts (iv) and (vii); also find and plot the group delay in both cases.