

UNIVERSITY OF CALIFORNIA, RIVERSIDE  
Department of Electrical Engineering  
WINTER 2025  
EE110B-SIGNALS AND SYSTEMS  
HOMEWORK 1

Please turn in by Friday, January 17th, 2025, 11:59PM.

**Problem 1:** Determine whether or not each of the following signals is periodic. If the signal is periodic, specify its fundamental period.

a)  $x[n] = \cos(0.9\pi n)$

b)  $x[n] = \cos(\pi^2 n)$

c)  $x[n] = e^{j\pi 0.16n}$

d)  $x[n] = e^{j\pi\sqrt{2}n}$

**Problem 2:** Consider the system given by

$$y[n] = x[n] - 0.005n x[n - 2] \text{ .}$$

Determine whether this system is linear, time-invariant, causal, and stable.

**Problem 3:** Let  $x[n] = 2^{-n}u[n]$ . Carefully sketch the following  $y[n]$ :

a)  $y[n] = x[n]u[3 - n]$

b)  $y[n] = x[n]^2$

c)  $y[n] = x[n^2]$

**Problem 4:** Determine whether the following transformations are invertible. If they are, express  $x[n]$  in terms of  $y[n]$ .

a)  $y[n] = nx[n]$

b)  $y[n] = \begin{cases} x[n - 1] & n \geq 1 \\ 0 & n = 0 \\ x[n] & n \leq -1 \end{cases}$

c)  $y[n] = \begin{cases} x[n/2] & n \text{ even} \\ 0 & n \text{ odd} \end{cases}$

d)  $y[n] = x[n]x[n - 1]$ .