EC401 TEST 1 (Spring 2020)
60 minutes, Closed Book, No Electronics, Formula Sheet Provided.

Throughout this test, $\delta[n]$ and $u[n]$ denote the unit impulse and unit step respectively.

Problem 5.1 (10 points)
Given that $x[n] = u[n + 2] + u[n - 3] - 2u[n - 4]$, sketch the *odd part* of $x[n]$. *Justify your answer.*

Problem 5.2 (10 points)

Given that $x[n] = \sum_{k=-2}^{5} \delta[n - k]$, sketch $g[n] = x[1 - n]$. *Justify your answer.*

Problem 5.3 (10 points)
Sketch the signal $x[n] = \delta[-n - 1]$. *Justify your answer.*

Problem 5.4 (10 points)
Determine the numerical value of the real number α such that the signal specified by the equation $x[n] = u[n] - \alpha \sum_{k=-\infty}^{n-2} \delta[k]$ has an impulse decomposition that can be written as $x[n] = \sum_{k=0}^{2} x[k]\delta[n - k]$. *Justify your answer.*

Problem 5.5 (10 points)

Consider the system S for which S:$x[n] \rightarrow y[n] = \begin{cases} 0 & \text{if } x[n] = 0 \\ x[n]/|x[n]| & \text{otherwise} \end{cases}$

Is S a linear system? *Justify your answer.*

Problem 5.6 (10 points)
Consider the system S for which S:$x[n] \rightarrow y[n] = x[0]x[n - 1]$. Is S a time invariant system? *Justify your answer.*

Problem 5.7 (5 points)
Sketch the signal $y[n] = u[n^2]$. *Justify your answer.*