

Full Name: _____
ECE 3500 (Fall 2016) – Examples #3

Lab Section: _____

Question #1:

(a) Sketch $x[n] = 3u(n - 1) - 5u(n - 3) + 2u(n - 5)$

(b) Sketch $y[n] = x[n + 1]$

(c) Sketch $z[n] = y[2n]$

(d) Write $z[n]$ in terms of $x[n]$.

(e) Compute the energy of $z[n]$.

Question #2: Consider the following system with input $x(t)$ and output $y(t)$,

$$y(t) = x(t)u(t)$$

(a) (2 pts) Sketch $y(t)$ for $x(t) = e^{-t}$

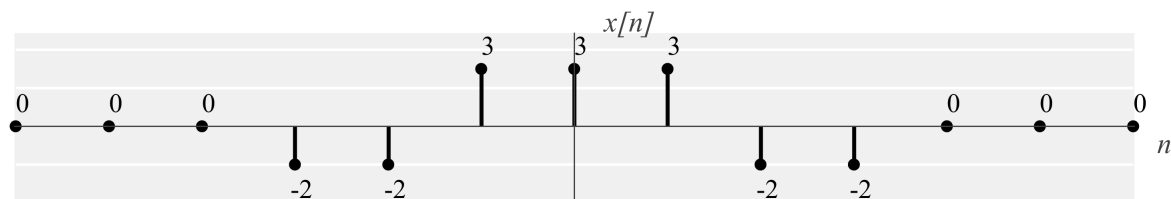
(b) (3 pts) Is the system linear?

(c) (3 pts) Is the system time-invariant?

(d) (2 pts) Is the system causal?

(e) (2 pts) Is the system memoryless?

Question #3: Consider the following signal discrete-time signal $x[n]$. Assume the zeros continue forever for $n \rightarrow -\infty$ and $n \rightarrow \infty$.



(a) (3 pts) Express $x[n]$ as a sum of weighted and delayed step functions, i.e. in the form

$$x[n] = \sum_{m=0}^M a_m u[n - d_m].$$

Question #4: Consider two signals defined by:

$$x(t) = \sum_{k=-\infty}^{\infty} \delta(t - 2k) \quad , \quad z(t) = x(t) + x(t/3) + x(t/2)$$

(a) (2 pts) Sketch $x(t)$

(b) (2 pts) Is $x(t)$ periodic? If it is, compute its fundamental period.

(c) (2 pts) Is $z(t)$ periodic? If it is, compute its fundamental period.

Question #5: Consider the continuous-time system defined by the following input-output relationship

$$y(t) = \sum_{m=-1}^2 mx(t-m)$$

(a) (3 pts) Sketch $y(t)$ for the input $x(t) = u(t)$

(b) (2 pts) Is the system memoryless?

(c) (2 pts) Is the system causal?

(d) (3 pts) Is the system BIBO stable?