Full Name: _____ **Lab Section:** _____

ECE 3500 (Fall 2022) – HW #1 **Due Date: Sep. 01, 2022**

Homework learning objectives: By the end of this homework, you should be able to:

- Intuitively understand the fundamental properties
- Sketch continuous-time signals and discrete-time signals

Question #1: *(2 pts)* How many hours did you spend on this homework?

Question #2: *(3 pts)* Throughout this class, we refer to our signals as either continuous-*time* signals or discrete-*time* signals. This "time-centric" description is largely used for intuitive simplicity. Many signals measured and analyzed in the world are not *time* signals.

(a) Present two examples of a signal that are *not* a time signal? Wha is each this signal used for? What is the dimension of each signal? Is the example continuous-time or discrete time?

Question #3: *(5 pts)* Let $x(t) = \cos(\pi t/2)$ be a continuous-time signal.

(a) Sketch the signal $x(t)$ for $-4 < t < 4$.

(b) what is the dimension of $x(t)$?

(c) Is $x(t)$ a deterministic signal?

(d) Is $x(t)$ periodic? If so, find its fundamental period and fundamental frequency

(e) Is $x(t)$ an even signal, an odd signal, or neither.

(f) Is $x(t)$ causal, anti-causal, or non-causal?

(g) Compute the energy of $x(t)$ [for *all* time].

(h) Compute the power of $x(t)$ [for *all* time].

(i) Is $x(t)$ an energy signal, a power signal, or neither?

Question #4: *(5 pts)* Let $x(t) = \begin{cases} 0 & \text{if} \quad t < -1 \\ e^{-(t+1)} & \text{if} \quad t \geq -1 \end{cases}$ be a continuous-time signal, repeat Question #3.

Question #5: *(5 pts)* Let $x[n] = \cos(\pi n/2)$ be a discrete-time signal.

(a) Sketch the signal $x[n]$ for $-4 < n < 4$.

(b) what is the dimension of $x[n]$?

(c) Is $x[n]$ a deterministic signal?

(d) Is $x[n]$ periodic? If so, find its fundamental period and fundamental frequency

(e) Is $x[n]$ an even signal, an odd signal, or neither.

(f) Is $x[n]$ causal, anti-causal, or non-causal?

(g) Compute the energy of $x[n]$ [for *all* time].

(h) Compute the power of $x[n]$ [for *all* time].

(i) Is $x[n]$ an energy signal, a power signal, or neither?

Question #6: *(5 pts)* Let $x[n] = \begin{cases} 0 & \text{if } n < 2 \\ e^{-(n-2)} & \text{if } n \geq 2 \end{cases}$ be a discrete-time signal, repeat Question #5.