

1. For each signal below, do the following:

- i. Sketch $x(t)$ by hand, i.e. don't use Matlab.
- ii. State whether it is finite or infinite duration. If infinite duration, is it right-sided, left-sided, or two-sided?
- iii. State whether it is causal, anti-causal, or mixed causal.
- iv. Is it periodic or aperiodic?
- v. Calculate the metrics E_x , P_x , and M_x .

a. $x(t) = e^{-t} \text{rect}((-t/4) + (1/2))$

b. $x[n] = \sum_{k=0}^5 \mathbf{d}(n-k) \cos(\mathbf{p}/3 \cdot n)$

2. For the signal $x(t)$ below, calculate $\text{Re}\{x(t)\}$, $\text{Im}\{x(t)\}$, and $|x(t)|$.

$$x(t) = i \exp(t + it^2)$$

3. For each system below, determine whether or not it is:

- i. linear,
- ii. time-invariant,
- iii. causal,
- iv. stable,
- v. memoryless

For each of the above properties, if you think it holds, prove it. Otherwise, find a counter-example.

a. $y[n] = x[n^2]$

b. $y[n] = x[n+1] - x[n]$

c. $y[n] = 1$