EE-3032, HW-1

Dr. Durant, Winter 2019-20

This assignment is due at the ***beginning of the Monday class*** in week 2. This assignment contains some review from previous classes and some new material. Please ask for help if needed. Please note that I allow students to work together, but each student must clearly develop their own solution. Other professors have different policies.

You may do work using any combination of by hand, with a calculator, or with MATLAB. If using MATLAB, submit your code and results.

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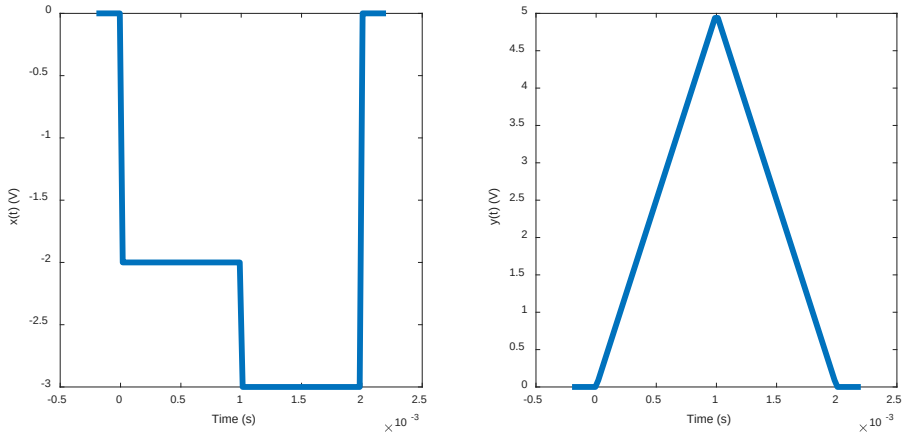
1. The functions $x(t)$ and $y(t)$ are plotted below. Plot $x^2(t)$, $y^2(t)$, and the product function $y(t)x(t)$ over the interval $0 \leq t \leq 2ms$. Clearly label all axes and units on the axis.

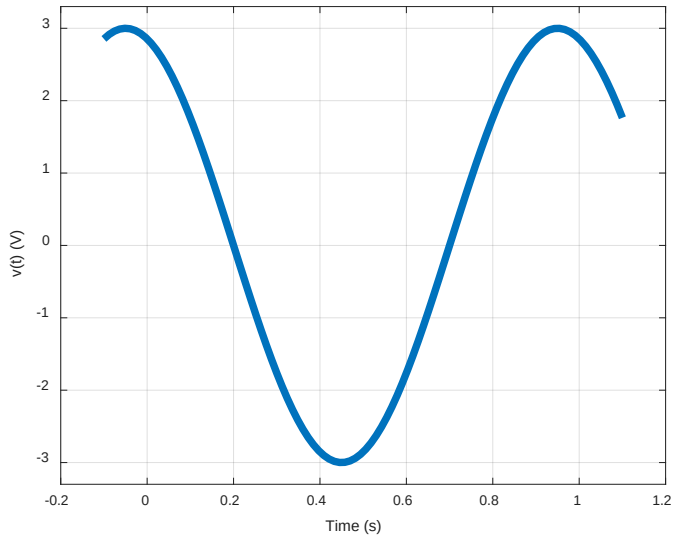


2. Using Euler's formula, write a simplified expression for $x(t) = \mathrm{Im}\{e^{j(4\pi t - \pi/2)}\}$ and evaluate it for $t = 0, 0.125, 0.25, 0.375, 0.5$

3. Write an expression for the complex conjugate of the function $f(t) = x(t)y(t)$, where $x(t) = e^{-j15t}$ and $y(t) = \frac{1}{4}t - \frac{1}{5}j$. Recall that the conjugate of a product is the product of the conjugates. Simplify conjugates.

4. For the analog sinusoidal voltage shown below, illustrate:

    a. Sampling the signal (going from continuous to discrete time) with a period of 0.2 s.
    b. Then quantizing the signal (going from continuous/analog voltage) with a resolution of 0.5 V.



5. How many levels ***and*** how many bits are needed for each sample of the above signal?
6. How much total memory in bits is needed to store the digital version of the signal?