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Assignment 2
7/13/2020

Assignment 2

- Problem 1:
  - For this problem we simply plotted the same function three times, but with different steps. In order to find the period I simply scrolled over the largest point on each of the functions and measured the distance between the gaps and the period ended up being roughly .5(seconds) for all 3 of the functions below is the graphs:

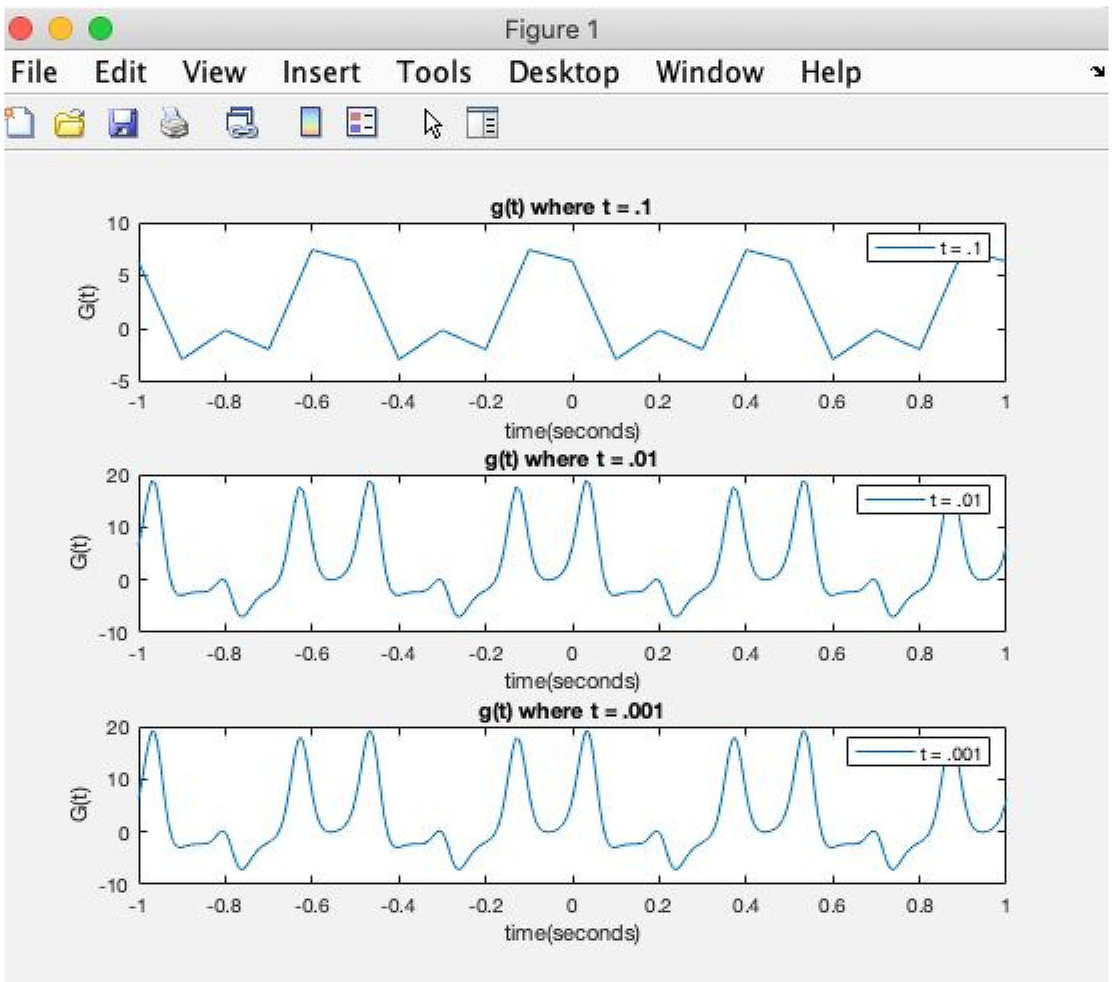


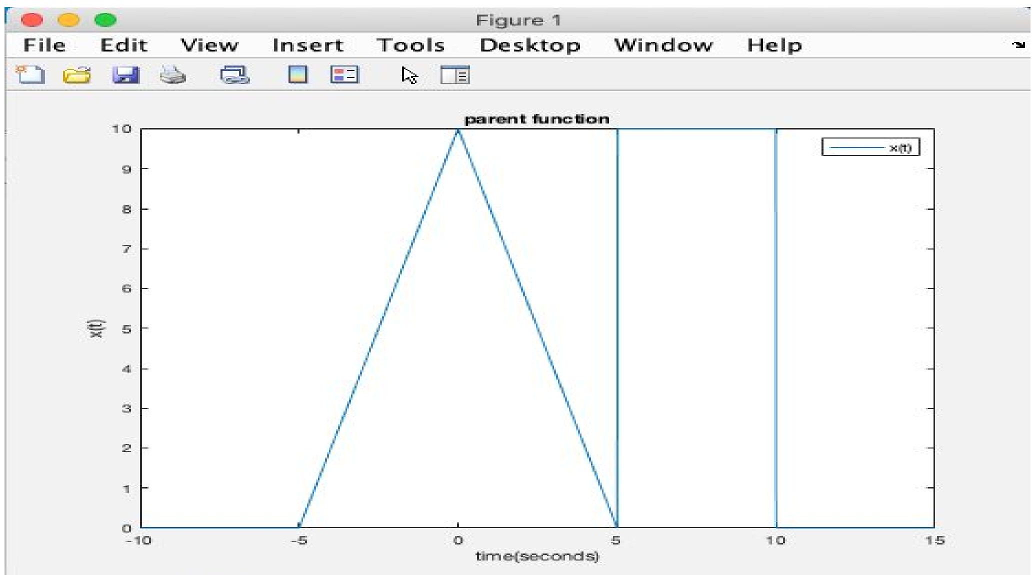
*Figure 1 above is the result from problem 1

- Problem 2:

- For this problem we simply created the following function in matlab

$$x(t) = \begin{cases} -2|t| + 10, & t \in [-5, 5) \\ 10, & t \in [5, 10) \\ 0, & \text{elsewhere} \end{cases}$$

*Figure 2 is the function we plotted in problem 2 from the lab manual
In order to plot this I personally followed the readings method which was to create 5 different functions for each of the time periods and simply combine all of their results in order to create one large function. In order to do the different combinations also required I simply would modify the value prior to entering the plot functions for example in order to plot x(t+2) i would simply modify plot(t+2,f(t)) instead as seen below:



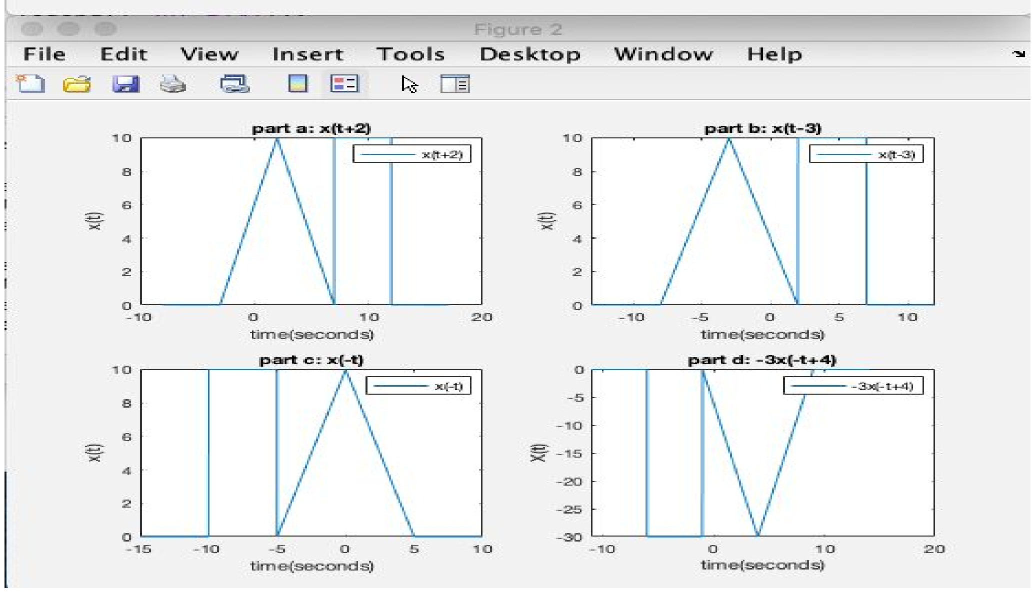
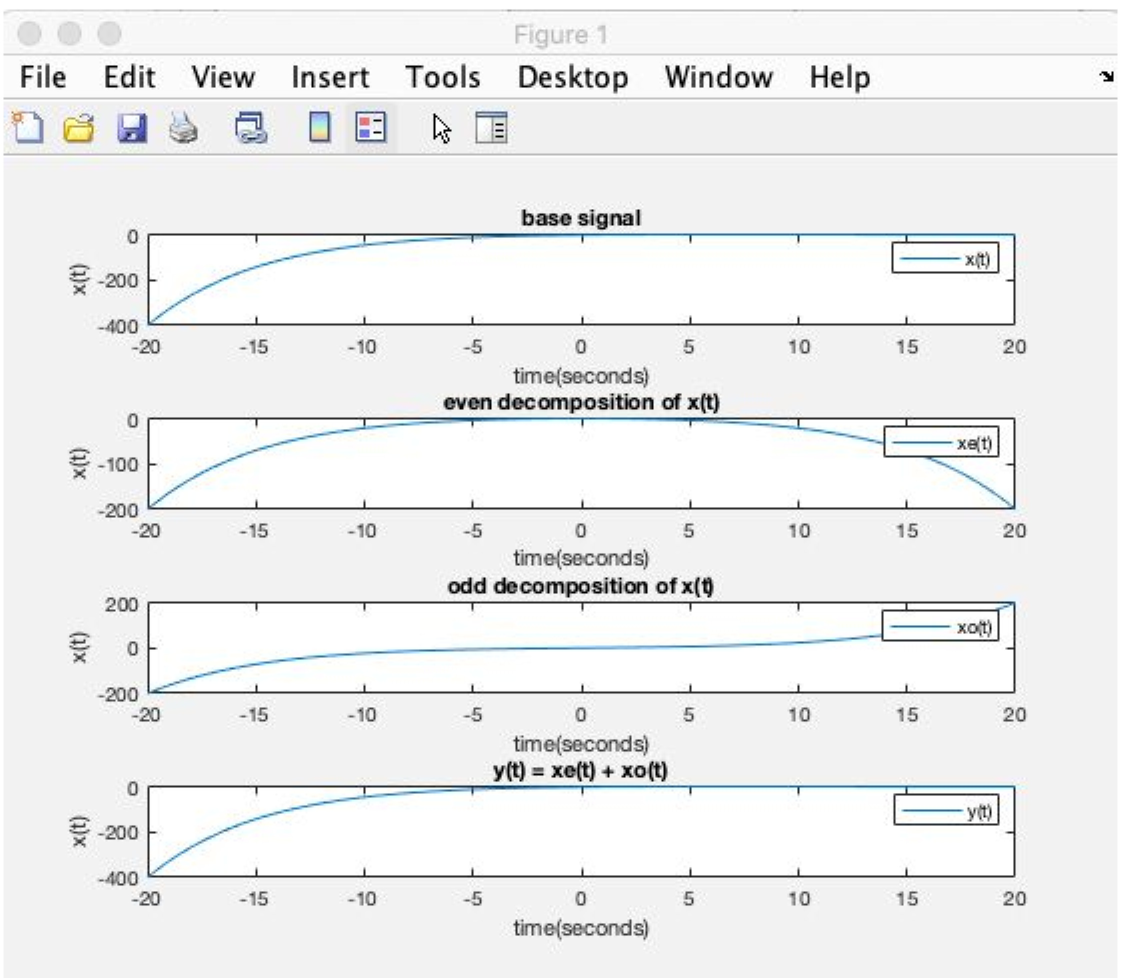


*Figure 3 above is the result from problem 2.

- Problem 3:
  For this problem we were required to plot a function(f(x)) then plot the odd and even decompositions of the function as well as the combination of the two of them. In order to calculate the odd or even decomposition I simply referred to the model below:

$$
\begin{array}{ll}
\text{Even part} & x_{\mathrm{e}}(t) = \frac{1}{2}\{x(t) + x(-t)\} \\
\text{Odd part} & x_{\mathrm{o}}(t) = \frac{1}{2}\{x(t) - x(-t)\} \\
\text{Sum} & x(t) = x_{\mathrm{e}}(t) + x_{\mathrm{o}}(t)
\end{array}
$$

  - Figure 4 above is the formulas provided by the textbook
    The results are shown in Figure 5 below:



- Problem 4:

For this problem the student was required to find the power and energy of the function. In order to do this I simply followed the formula below as well as using the integral function provided by matlab:

Signal Power and Energy

$$P_{\mathrm{av}} = \lim_{T \to \infty} \frac{1}{T} \int_{-T/2}^{T/2} |x(t)|^2 \, dt$$

$$E = \lim_{T \to \infty} \int_{-T}^{T} |x(t)|^2 \, dt = \int_{-\infty}^{\infty} |x(t)|^2 \, dt$$

*Figure 6 above is the formulas used to calculate the power and energy of a function.

The results were:

Energy = 27.3775 Joules

Power = 54.7550 Watts

- Problem 5:

  For this problem the student was plotting the frequencies from the musicians. In order to solve this problem the student was essentially creating a summation as seen below:

$$y(t) = \sum_{i=1}^{N} 10 \cos(2\pi f_i t)$$

*Figure 7 to the left is the function of y.

Initially I had attempted to use the system summation function, but I had noticed that this was problematic due to the fact that both t and f(i) are all varying meaning that it was difficult to simply put the function into the summation function. Therefore the student will instead use a loop and iterate from i to N and add the results into an array(y = y + function). Below is the result:

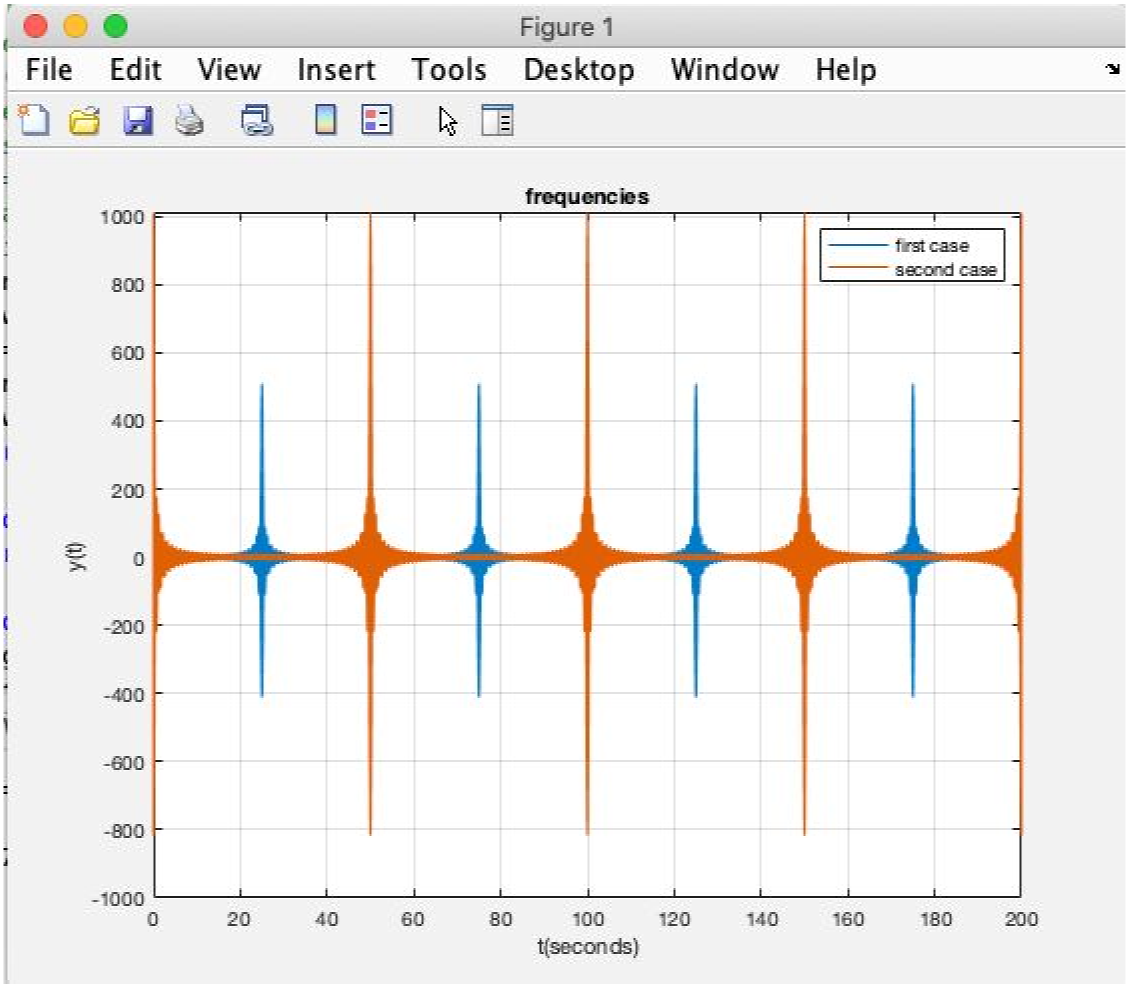


*Figure 8 above is the graphical representation of the functions created in problem 5.