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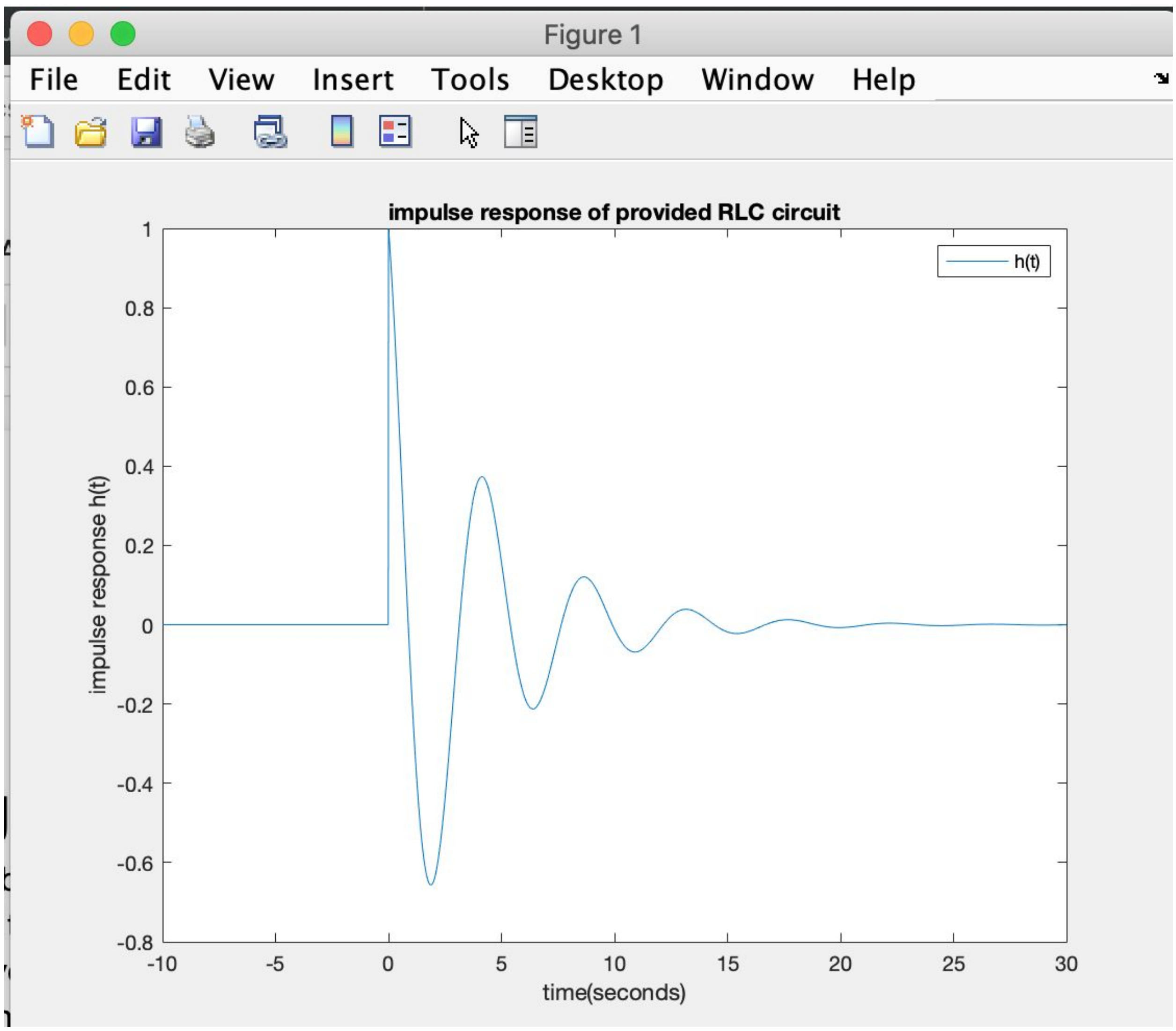
Assignment 2
7/20/2020

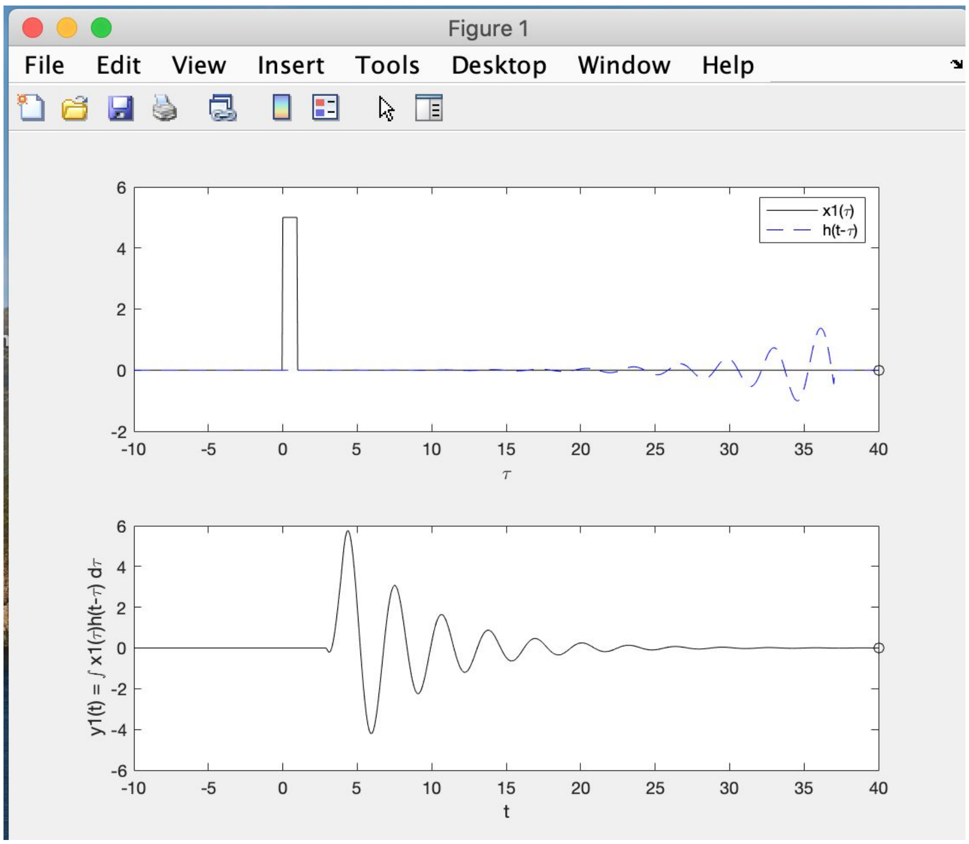
Assignment 3

- Problem 1:
  For this problem we simply solved and plotted a differential equation in order to solve the RLC circuit. In order to solve this we first need to plug in t = zero for both y(t) and dy(t)(personally i got y(0) = 0. dy(0) = 11). After running this the system will return the impulse response which was: impulse response h(t) = (exp(-t/4)*cos((31^(1/2)*t)/4) - (31^(1/2)*exp(-t/4)*sin((31^(1/2)*t)/4))/31)u(t) and below is figure 1 which is the figure plotted.



- Problem 2:

For this problem we simply received several functions of x(t) and plugged in these functions into simplified convolutions runtime.m(provided by the Teachers assistant). After plotting y_1(t) and y_2(t) you will combine these two and use this to plot y_combination(t) after this we will simply plot y3(t) = x1(t) + x2(t). Once these are plotted the student will notice that y3(t) is almost identical to the y linear combination as seen in figures 2-5 below:(from top to bottom its part a(y1(t), part b(y2(t), part c(y_combination(t)), and part d(y3(t)))



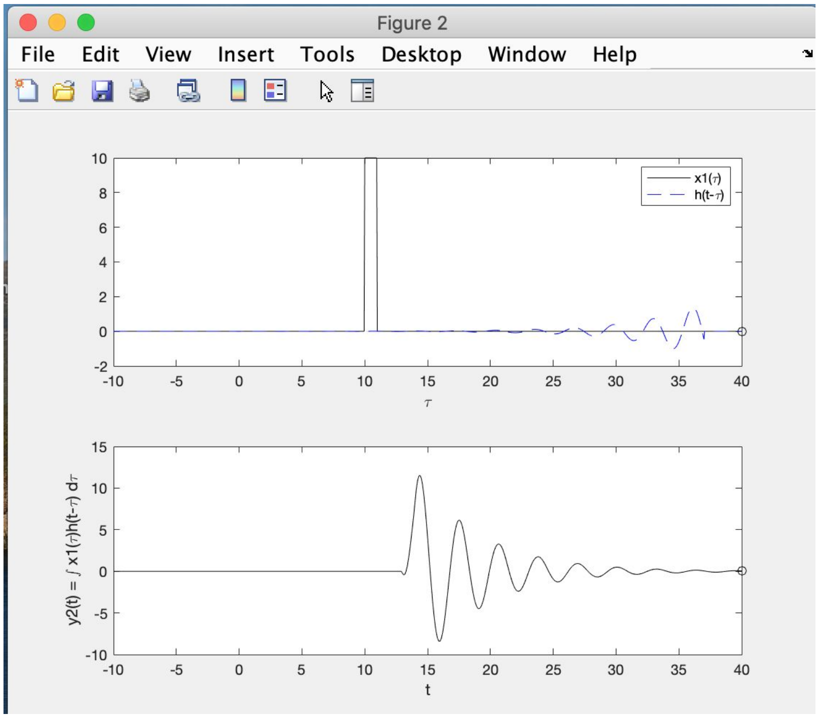
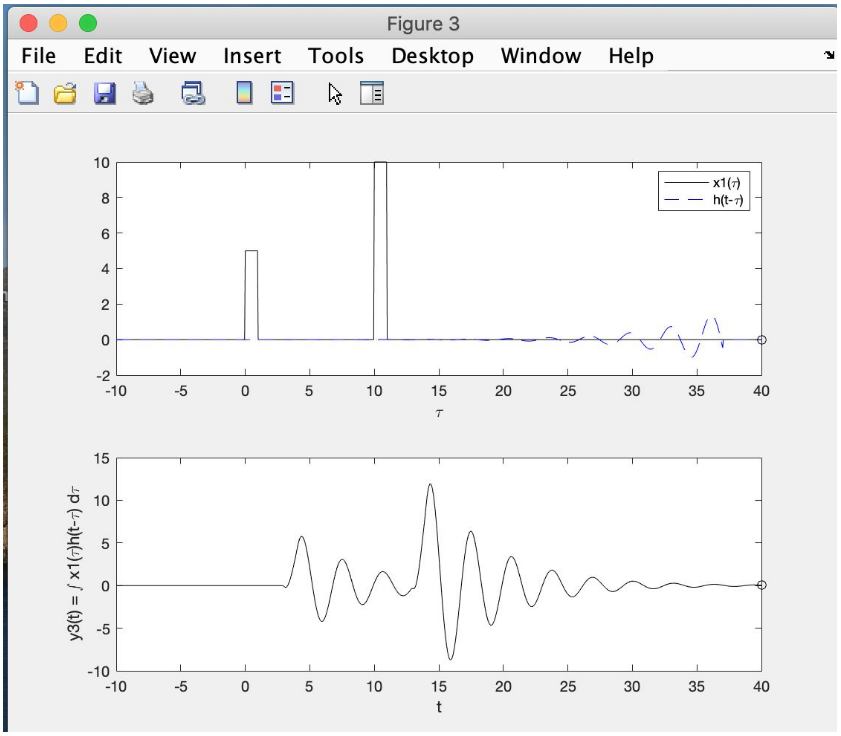
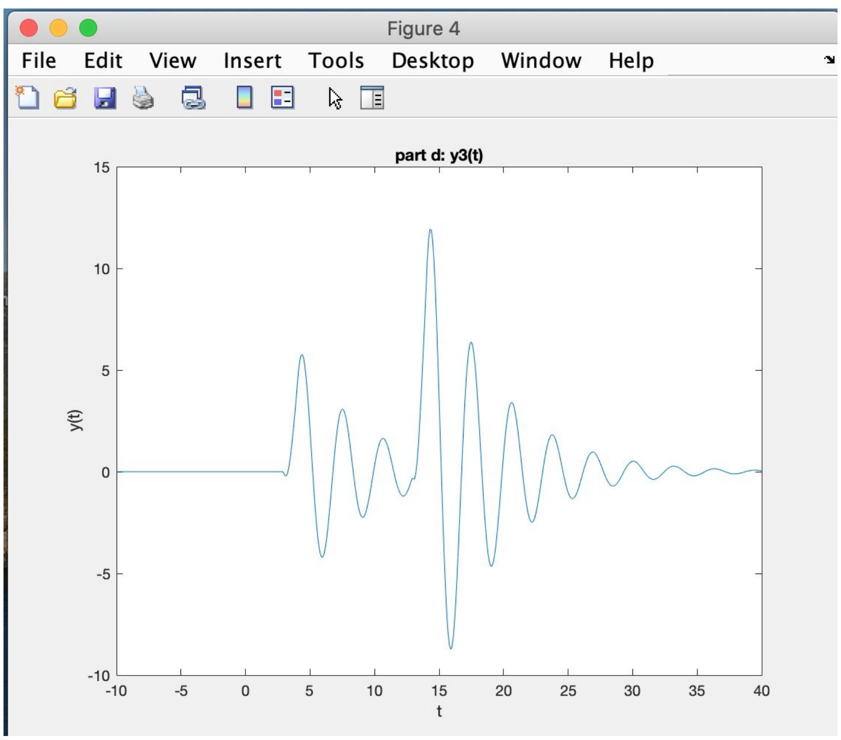


Figure 2
File Edit View Insert Tools Desktop Window Help
x1(τ)
h(t-τ)
τ
y2(t) = ∫ x1(τ)h(t-τ) dτ
t





- Problem 3:
  For this problem we simply received a single tone signal w(t) as well as h(t) and x(t) and are expected to find and plot the output signal(y(t)), the input signal(x(t)) and w(t). In order to find y(t) the student can simply use the convolution function(conv) on x(t) and h(t) as y(t) = x(t)*h(t) and after receiving the function

we can plot it. As seen in the figures below the filter is essentially ‘smoothing out’ the input function(x(t)) this can be seen in figures 6 & 7 as y(t) is more steady whereas x(t) is more jaggid.

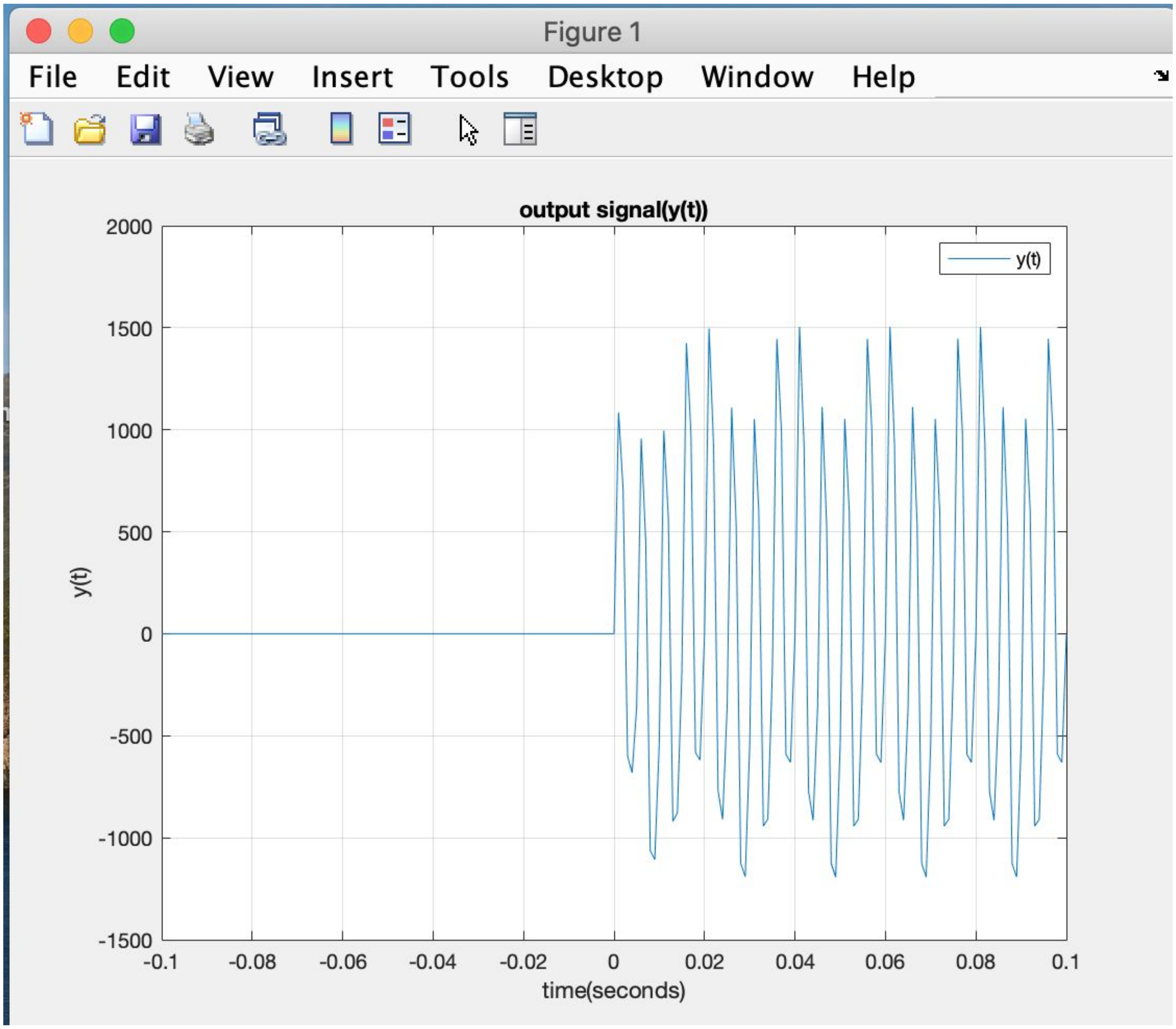


*Figure 6 above is the functionY(t) which was plotted after using the convolution function y(t) = conv(x(t), H(t), ‘same’).

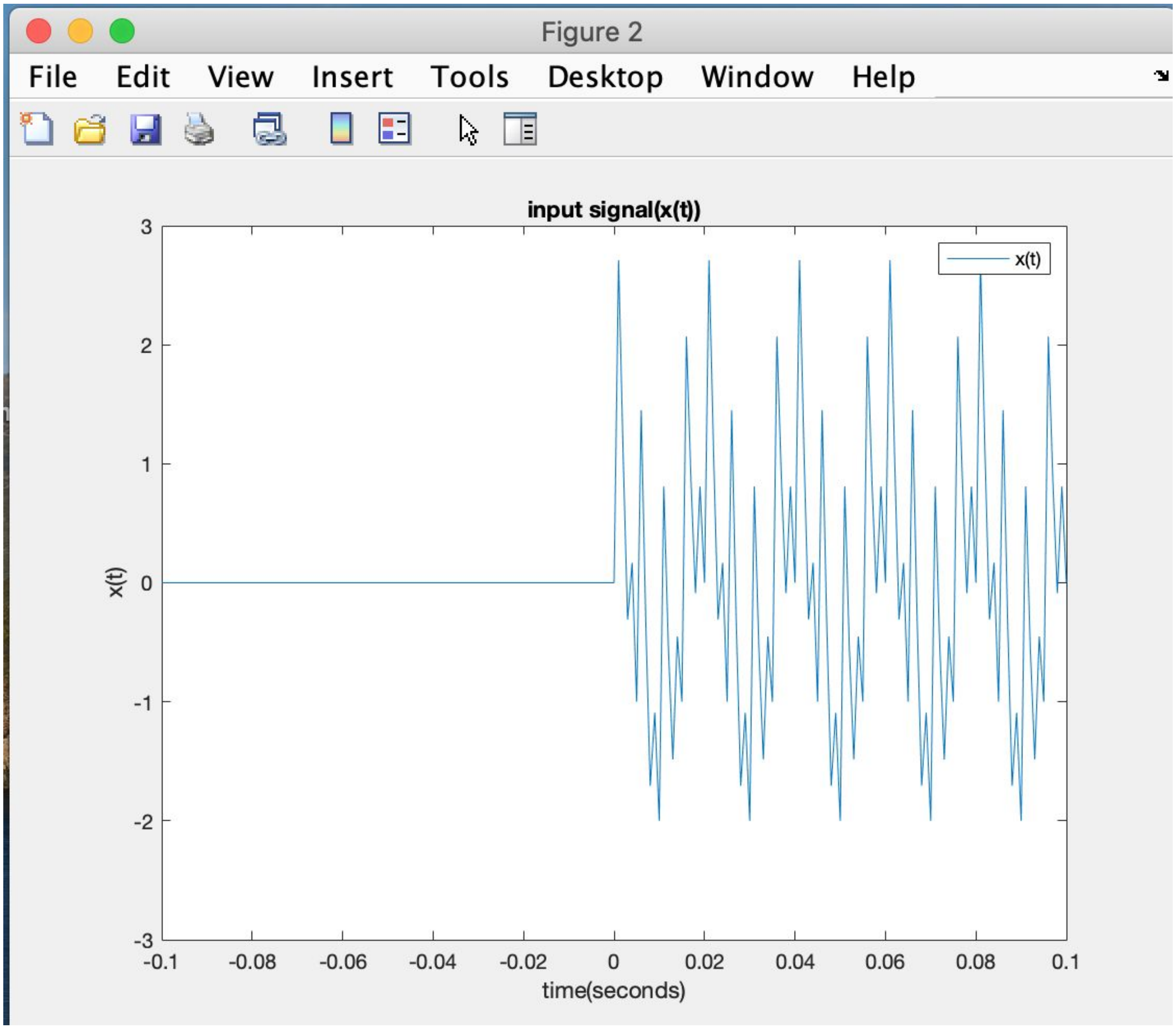


*Figure 7 above is the input signal x(t).

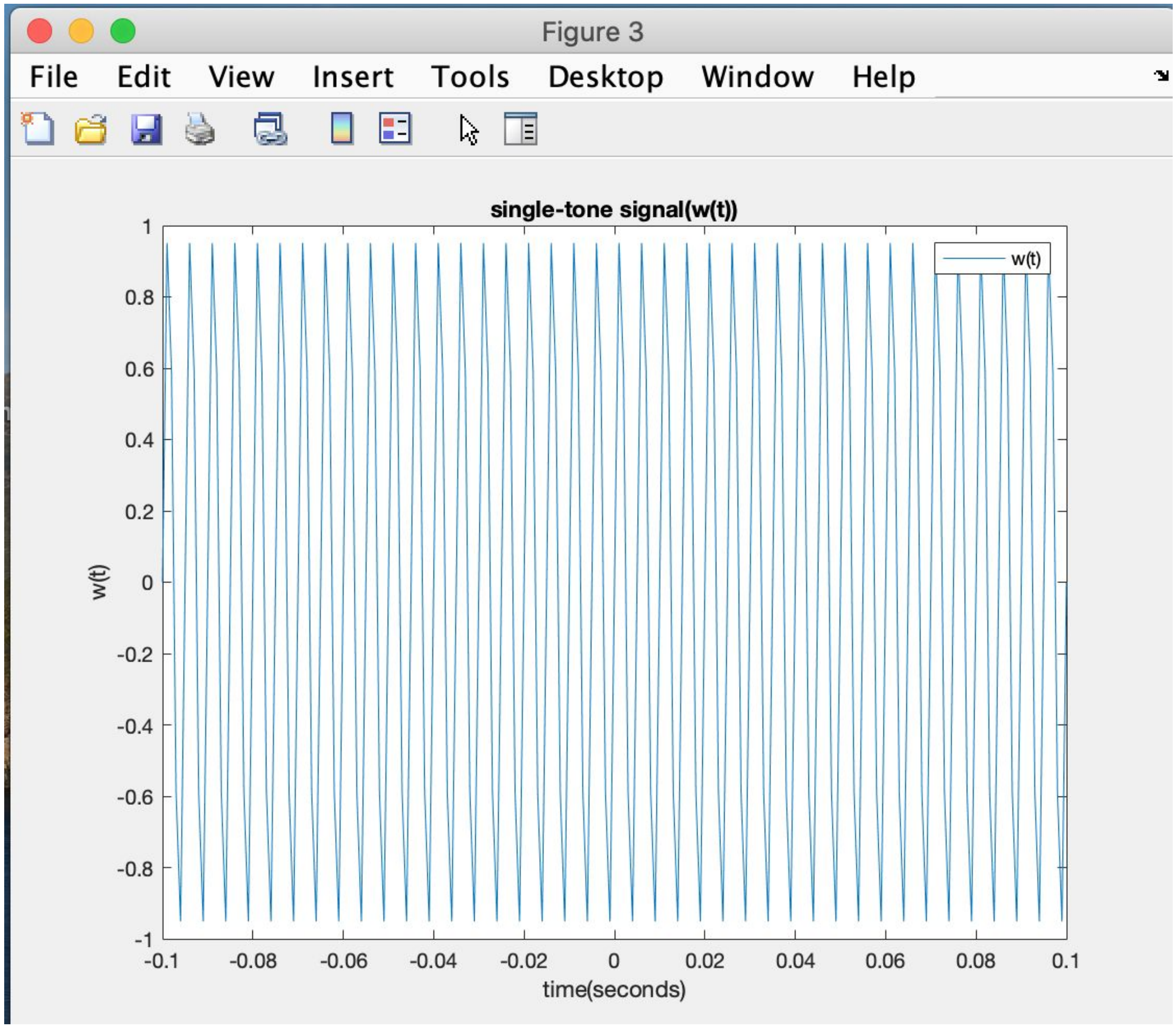


*Figure 8 above is the single tone signal (W(t)).

- Problem 4:
  For this problem we plotted two different differential equations which both were focusing on a industrial shock absorber at two different friction coefficients 100 kgs and .2kgs note: used y(0) = 0 and dy = 1 for both functions
  impulse response h_1(t) = (exp(-t/10) - (t*exp(-t/10))/10)u(t)
  impulse response h_2(t) = (exp(-t/1000)*cos((3*1111^(1/2)*t)/1000) - (1111^(1/2)*exp(-t/1000)*sin((3*1111^(1/2)*t)/1000))/3333)u(t)
  As in the figures below in the top figure with the higher friction coefficient the spring essentially dropped to zero and flattened out quickly, but in figure 2 it is taking much longer to steady and reach zero.

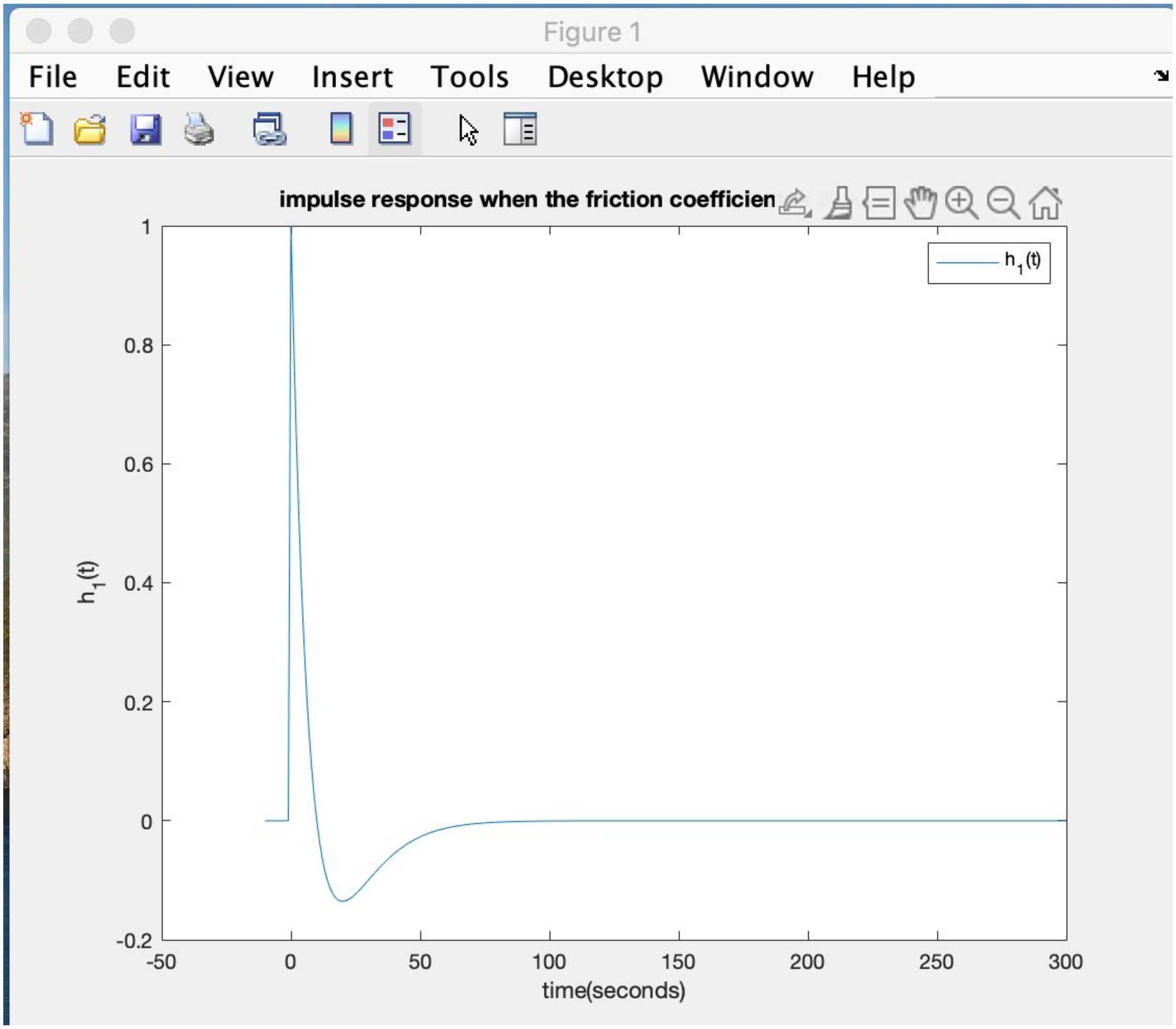


*Figure 9 is h1(t).

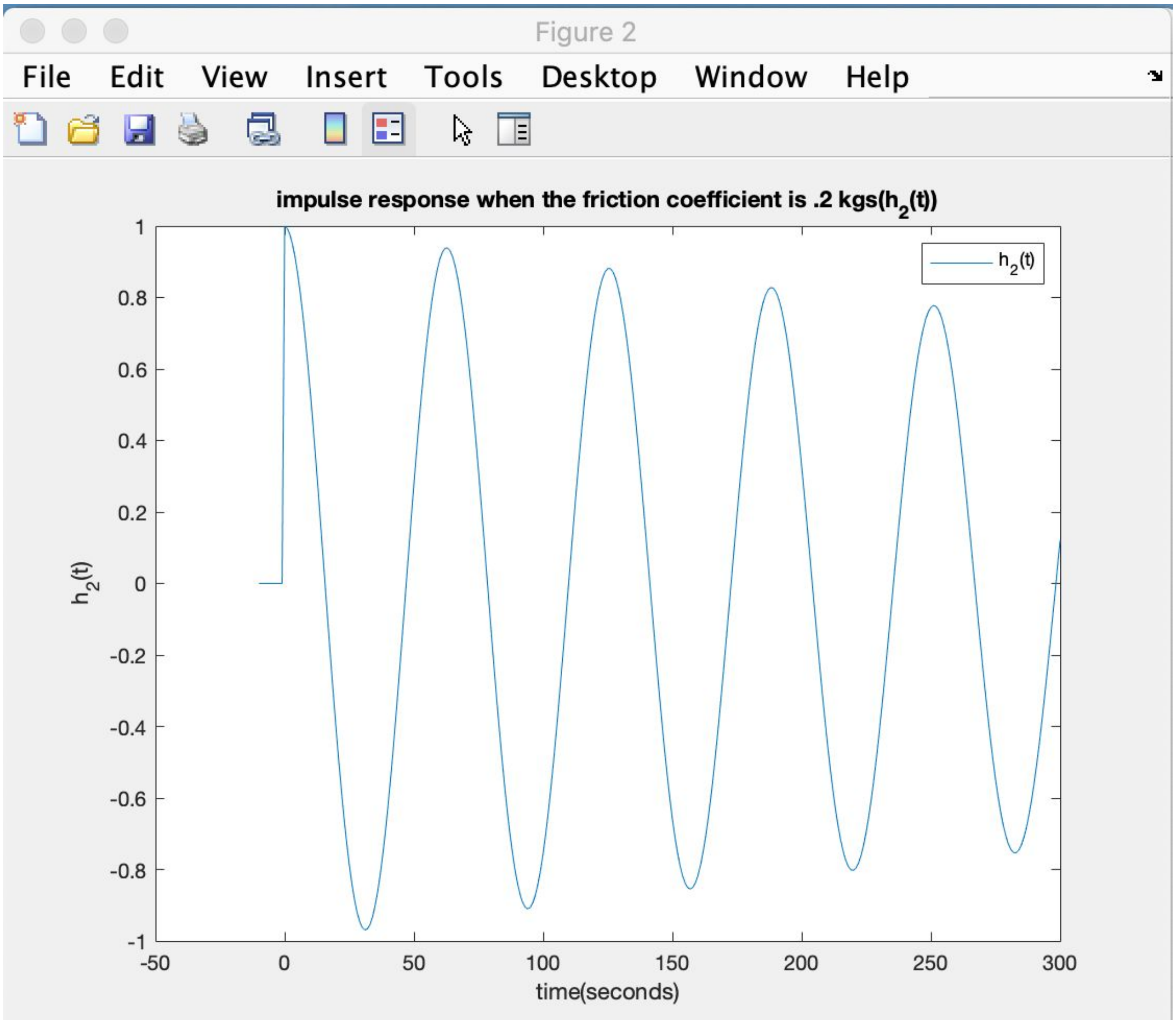


*Figure 10 is h2(t).