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Assignment 3
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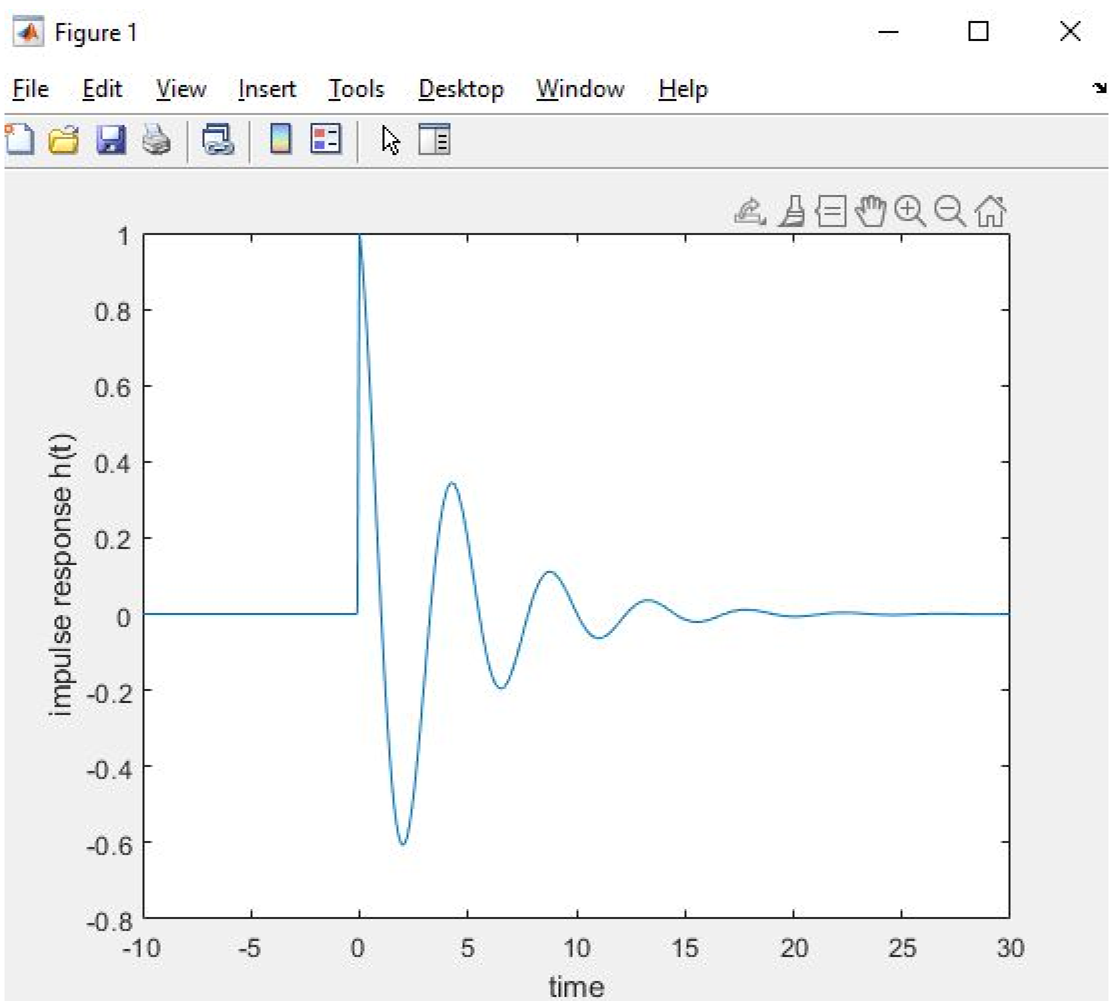
1. For Question 1, I followed the example code to use the dsolve function to solve the differential equation given. By picking simple initial conditions, such as y(0)=0 and Dy(0)=1, it made the solution simpler. Afterwards, I displayed the solution as an impulse response by multiplying it by the unit step function u(t). I then set the function h(t) using the function I just solved, and plotted the function with the specified interval.

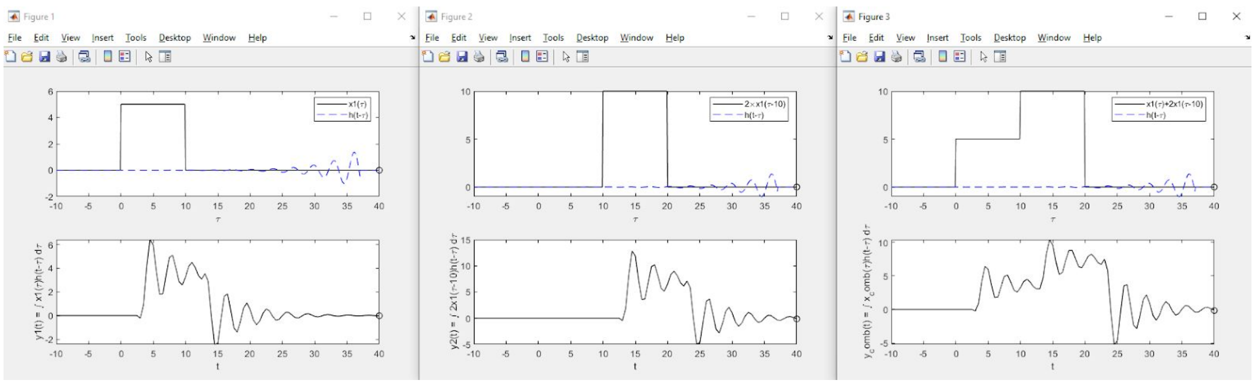
   Output:

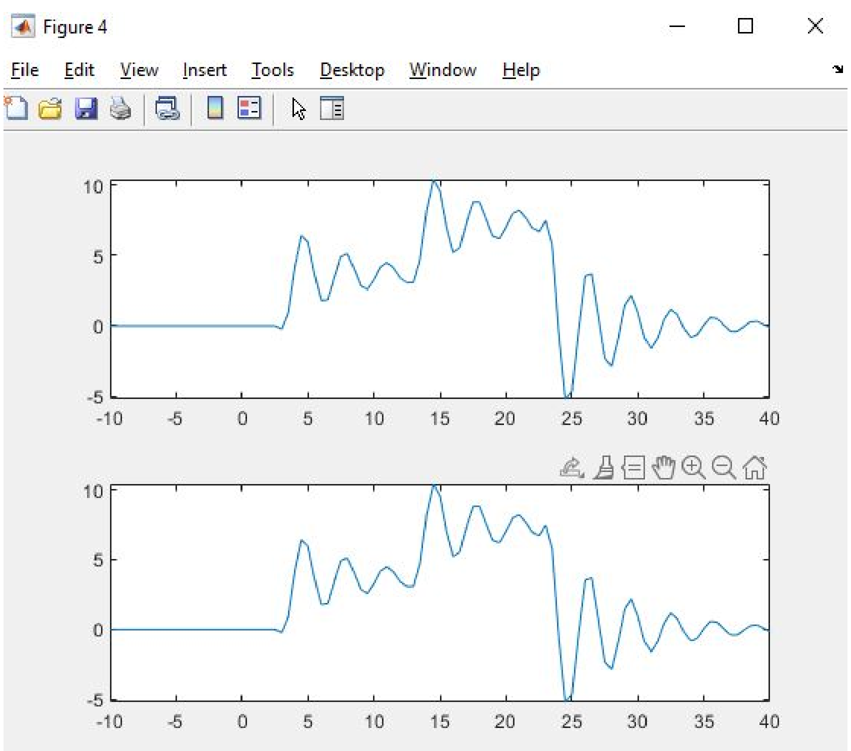
```
impulse response h(t) = (exp(-t/4)*cos((31^(1/2)*t)/4) - (31^(1/2)*exp(-t/4)*sin((31^(1/2)*t)/4))/31)u(t)
```



2. For Question 2, I followed the example code to create my piecewise function x1, and then used x1 to create x2. I then used both x1 and x2 to create x_{comb}. Afterwards, I followed the example code again and used a for loop to plot all 3 of the convolution output signals. In the for loop, I used the trapz function and drawnow to show the resulting output function using graphical convolution showing h(t) overlapping x(t) at different points in time. After plotting y3(t)=y1(t)+y2(t), I could see that y3(t) is exactly the same as $y_{linear\_comb}(t)$, which makes sense because of the additivity property of linear systems.

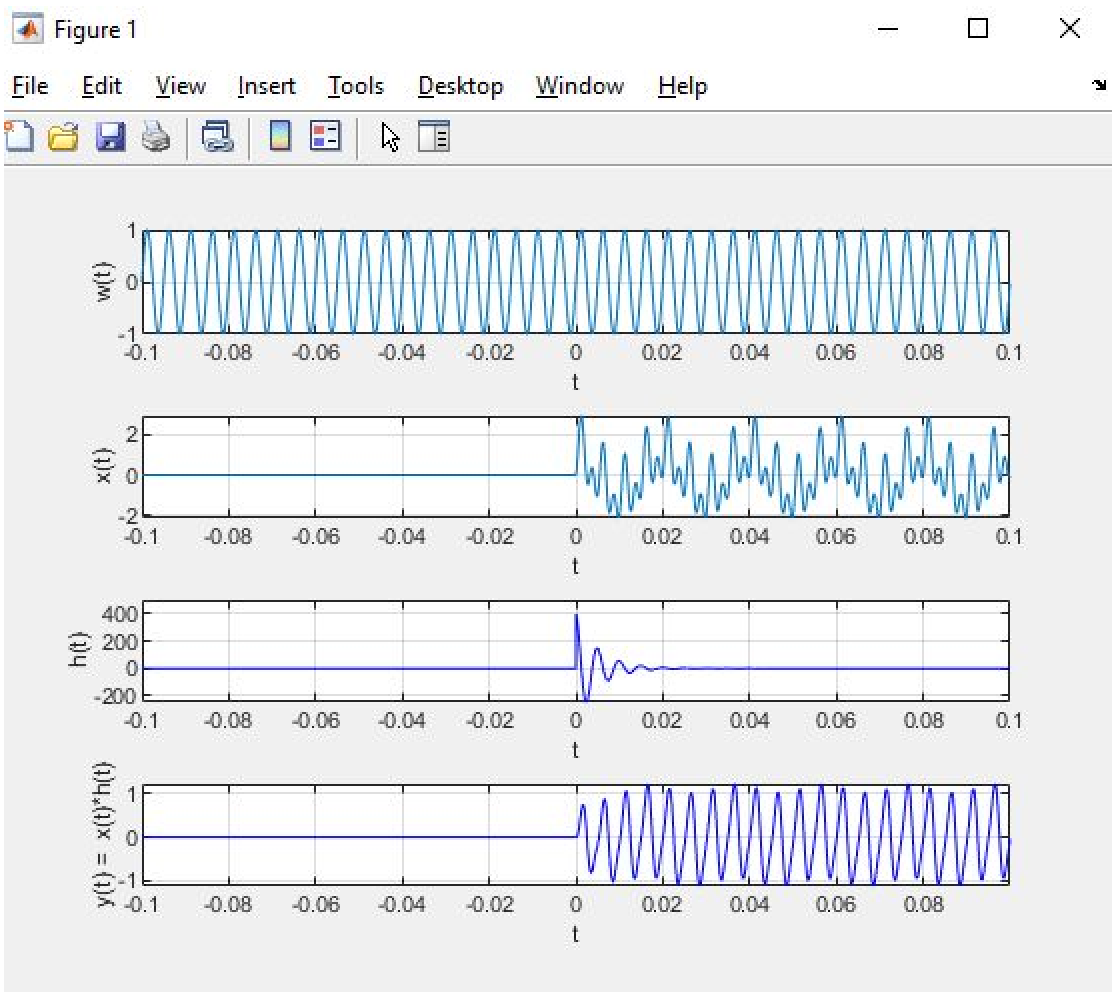
   Output:





3. For Question 3, I just followed the example code and given functions, and used the conv() function to find the output signal y(t). I then plotted the 4 functions in one figure. Although the corrupted signal x(t) is way off from the single-tone signal w(t), the filter h(t) seems to make the output signal y(t) much closer to the w(t) then the input signal x(t).

Output:



4. For Question 4, I basically followed what I did in Question 1, this time plotting 2 functions instead of 1.

   Output:

```
impulse response h(t) = (t*exp(-t/10))u(t)

impulse response h(t) = ((1000*1111^(1/2)*exp(-t/1000)*sin((3*1111^(1/2)*t)/1000))/3333)u(t)
```