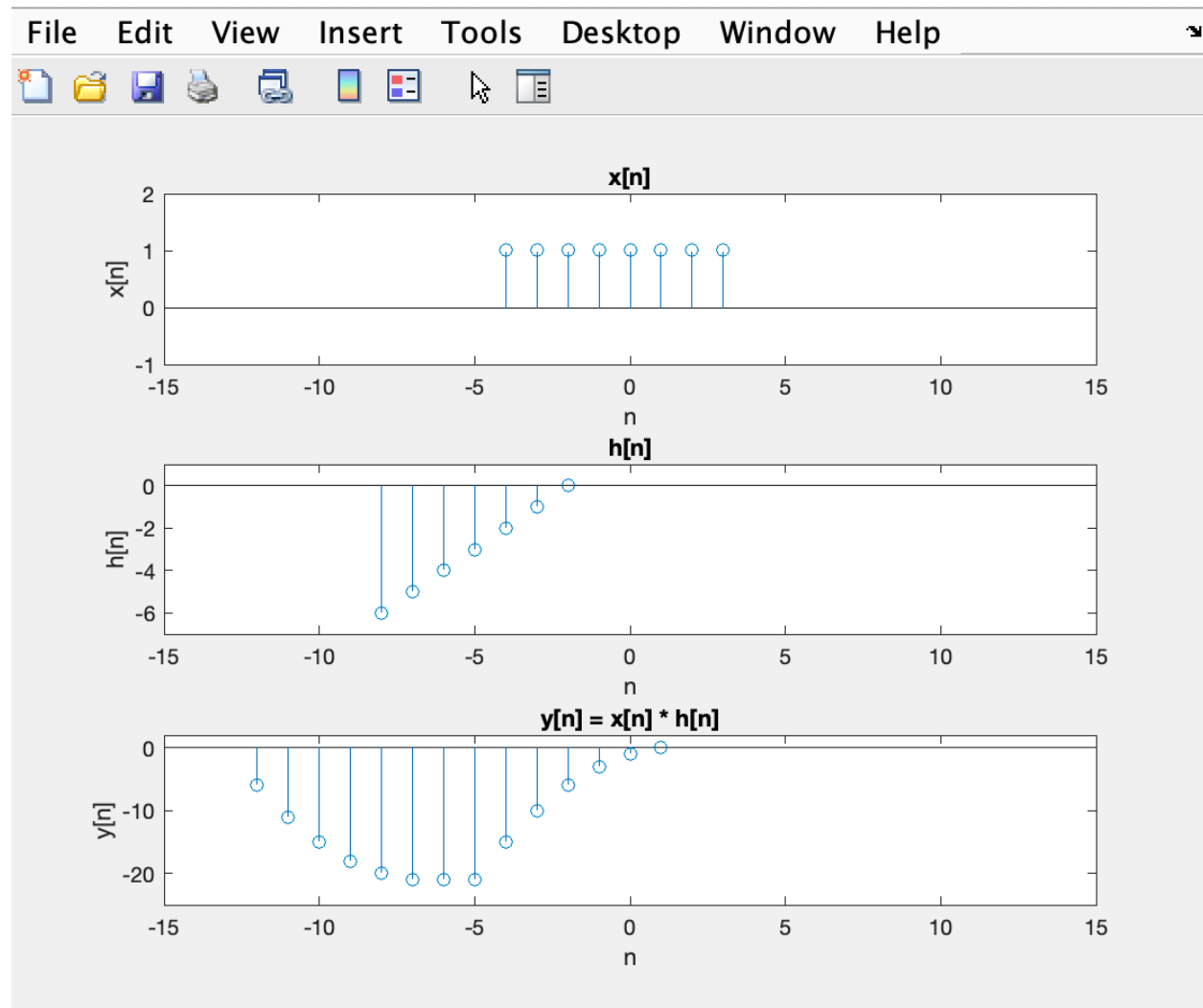


**Exercise 1 (DT convolution, 6 Points):** Find the convolution  $y[n] = x[n] * h[n]$ , where  $x[n] = 1$  for  $-4 \leq n \leq 3$  and zero otherwise, and  $h[n] = n + 2$  for  $-8 \leq n \leq -2$  and zero otherwise. Use `subplot` to plot  $x[n]$ ,  $h[n]$ , and  $y[n]$  vertically in three subfigures. For your plots, please make sure that: 1) all nonzero values of the signals are included; 2) the time indices are aligned.



**Exercise 2 (Convolution and echo, 5 Points):** There are several built-in MATLAB sounds, such as chirp, gong, handel, laughter, splat, and train. These sounds are built-in \*.mat files that define the sound to appear in a vector named y, and also define the sampling rate for that sound to be in Fs. Pick two sounds and figure out the length of the sounds in seconds. Next, pass the sounds of your choice through the following system:

$$h = [1, \text{zeros}(1, \text{dly} * Fs), 0.75];$$

where dly is the delay of the echo in seconds. Use soundsc to play both the input and output for various choice of dly. Explain what you hear.

For exercise 2, I used laughter and chirp for the two sounds. When the sound outputs, there is an overlap in the echoing. The first case has a delay of 0.5 seconds and the second case has a delay of 1 second. Compared to sounds like train or chirp, laughter is a longer file so it makes it harder to synchronise. However in order to align them and create an accurate echo overlap I used pause(2) and pause(3) after laughter and chirp respectively, which had the delay of 2 and 3 seconds to avoid the sounds overlapping each other.