Included in this assignment is the MATLAB script homework1.m. Open this script and complete the following tasks. Your homework submission should include your modified homework1.m script as well as a [published pdf](https://www.mathworks.com/help/matlab/matlab_prog/publishing-matlab-code.html) of your script output.

**Discrete and Continuous Functions:** It is important to be aware of how moving between discrete and continuous representations of a function can affect your results.

1. Plot the continuous-time function x(t) = sin(ωt) for ω = π/16, π/8, π/4, π/2, π, 15π/8, 2π, 5π/2, 3π, and 4π over the range t=0 to t=40 seconds. Use an appropriate number of samples so that the resulting plots appear to be continuous functions.
2. Plot the discrete-time function x[n] = sin(ωn) for the same values of ω over the range n=0 to n=40. Use the stemplot command stem() for discrete functions.
3. Compare the results of parts a and b. At what frequencies does the discrete representation cease to be recognizable as a periodic function? Explain in your own words why this occurs.
4. At what frequencies does the discrete representation appear to be a sine wave of a lower frequency than the corresponding continuous representation? Explain in your own words why this occurs (This phenomenon is called “aliasing.)

**Continuous and Discrete Functions:** Often, we can approximate a continuous differential equation as a discrete one if we use a sufficiently high sample rate. The homework1.m script includes code to simulate the response of a slowly charging capacitor to a unit step at t=2 () via a differential equation. Using the difference equation below, simulate the same response with a sample rate of , , and over the time period t=(0,10)

Compare your difference equation to the continuous model and describe what happens as the sample rate of the discrete model is increased.

**Response of Two RC Circuits:** The homework1.m script includes code to simulate two resistor-capacitor circuits. Circuit 1 and Circuit 2 are show below, respectively. You will be examining the properties of these circuits over the next few homework assignments. Complete the following tasks:

A picture containing clock

Description automatically generatedA picture containing object, clock

Description automatically generated

1. Change the signal variable to the function , using the variable t for time. Run the simulation and plot the results. You may have to zoom in to see meaningful results.
2. Change the signal variable to a sine function with a frequency of 100 Hz. Run the simulation and plot the signal and the output of both circuits. Do the same with a frequency of 1000 Hz. Describe what happens to each signal as it passes through each circuit. Use the same axis limits for all plots.
3. Create or find a custom sound file 1-5 seconds long and import it into MATLAB using the audioread() function. Pass your signal through each circuits. Use the sound() function to listen to the signal before and after passing through each circuit. Comment on the results.