EE 2000 Assignment # 7

(taken from Dr. Jingxian Wu, University of Arkansas, 2020.)

1. Find the periods and Fourier series coefficents of the following signals
   (a) $s(t) = \sum_{n=-\infty}^{\infty} \delta(t-n)$.
   (b) $s(t) = \sum_{n=-\infty}^{\infty} (-1)^n \delta(t-n)$
2. A voltage $x(t)$ is applied to the circuit shown in Fig. 2. If the Fourier coefficients of $x(t)$ are given by
$$c_n = \frac{1}{n^2+1} e^{jn\frac{\pi}{3}} \tag{1}$$
   (a) Express the system in the form of a differential equation
   (b) Find the transfer function of the system
   (c) Plot the amplitude and phase of the transfer function with Matlab
   (d) Find the first three non-zero harmonics of y(t)

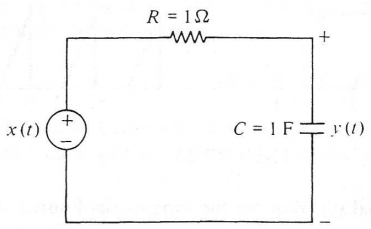

Figure 1: Questions 2, 3, and 4.

3. Repeat Question 3 if $y(t)$ is the voltage across the resistor instead.
4. For the RC circuit shown in Figure 2, find the voltage $y(t)$ across the capacitor if the input is
$$x(t) = 1 + 3\cos\left(t + \frac{\pi}{6}\right) + \cos(2t) \tag{2}$$