ECE 301 Homework Assignment 7

Take the first four letters of your last name and the first four of your first name. Since I will be generating an answer key using Matlab, please use your “official” name string from the following list.


For purposes of illustration, suppose the result is “GrimReap”. Now construct a signal $x(t)$ as follows:

**Step 1:** Replace the string of characters by their location in the alphabet (ignoring case). For example

“GrimReap” $\rightarrow (7, 18, 9, 13, 18, 5, 1, 16)$.

**Step 2:** Construct four fractions from the eight numbers in your string. For example

$ (7, 18, 9, 13, 18, 5, 1, 16) \rightarrow (7/18, 9/13, 18/5, 1/16)$.

**Step 3:** Use the resulting string of fractions as frequencies $\omega_1, \omega_2, \omega_3, \omega_4$, in the following expression for $x(t)$,

$$ x(t) = \cos(\omega_1 t) + 2 \cos(\omega_2 t) + 3 \sin(\omega_3 t) + 4 \sin(\omega_4 t). $$

For example

$ (7/18, 9/13, 18/5, 1/16) \rightarrow x(t) = \cos(7t/18)+2 \cos(9t/13)+3 \sin(18t/5)+4 \sin(t/16)$.

**Step 4:** Solve the problems below.

1. Express your $x(t)$ as a Fourier series.
   (a) Determine the fundamental period and frequency of your $x(t)$.
   (b) Determine the trigonometric Fourier series.
   (c) Determine the compact trigonometric Fourier series.
   (d) Determine the exponential Fourier series.

2. Find the output of the system with transfer function $H = 1/(2s + 1)$ whose input is your $x(t)$. 