Chapter 3, Solution 38.

Graph the magnitude and phase of the complex-sinusoidal response of the system described by

\[ y'(t) + 2y(t) = e^{-j2\pi ft} \]

as a function of cyclic frequency, \( f \).
Chapter 3, Solution 50.

A CT function is non-zero over a range of its argument from 0 to 4. It is convolved with a function which is non-zero over a range of its argument from -3 to -1. What is the non-zero range of the convolution of the two?

Ans: from -3 to +3

Chapter 3, Solution 52.

Sketch \( g(t) = \text{tri}(2t) \ast \text{comb}(t) \) and determine the CTFS \( X[k] \)

Chapter 4, Solution 21.

A periodic signal, \( x(t) \), with a period of 4 seconds is described over one period by

\[
x(t) = 3 - t, \quad 0 < t < 4
\]

Plot the signal and find its trigonometric CTFS description. Then plot on the same scale approximations to the signal, \( x_N(t) \), given by

\[
x_N(t) = X_c[0] + \sum_{k=1}^{\infty} X_c[k] \cos(2\pi kf_r t) + X_s[k] \sin(2\pi kf_r t)
\]

for \( N = 1, 2 \) and 3. (In each case the time scale of the plot should cover at least two periods of the original signal.)
Using \( \int_{-\infty}^{\infty} \cos(\omega t) dt \), we get

\[
\int_{-\infty}^{\infty} \cos(\omega t) dt = \frac{\sin(\omega T)}{\omega}.
\]

Making the change of variable \( \lambda = \frac{t}{T} \)

\[
\int_{0}^{T} \cos(\omega t) dt = \frac{\sin(\omega T)}{\omega}.
\]
Chapter 4, Solution 22.

A periodic signal, \( x(t) \), with a period of 2 seconds is described over one period by

\[
x(t) = \begin{cases} 
\sin(2\pi t), & |\lambda| < \frac{1}{2} \\
0, & \frac{1}{2} < |\lambda| < 1
\end{cases}
\]

Plot the signal and find its complex CTFS description. Then plot on the same scale approximations to the signal, \( x_N(t) \), given by

\[
x_N(t) = \sum_{k=-N}^{N} X[k] e^{j2\pi \lambda ft}
\]
for \( N = 1, 2 \) and 3. (In each case the time scale of the plot should cover at least two periods of the original signal.)

\[
T_0 = 2, \quad f_0 = \frac{1}{2}
\]

\[
X[k] = \frac{1}{T_0} \int_{t_0}^{t_0 + T_0} x(t)e^{-j2\pi f_0 t} dt = \frac{1}{2} \int_{-1}^{1} x(t)e^{-jk\pi t} dt
\]
Chapter 4, Solution 25.

Using the CTFS table of transforms and the CTFS properties, find the CTFS harmonic function of each of these periodic signals using the time interval, $T_F$, indicated.

(d) $x(t) = 2\cos(24\pi t) - 8\cos(30\pi t) + 6\sin(36\pi t)$, $T_F = 2$