EECS 360
Spring 2021
Continuous time Fourier Transform (CTFT)

1. Find the continuous time Fourier Transform (CTFT) and plot the magnitude of the continuous time Fourier Transform (CTFT) of the following signals:
   a. $x(t) = rect(t/\tau)$ for $\tau = 1ms, 10ms$
   b. $x(t) = z(t) * y(t)$ where $z(t) = rect(\frac{t}{2})$, $y(t) = rect(t)$ where $*$ means convolution
   c. $x(t) = tri(t/\tau)$ for $\tau = 1ms, 10ms$
   d. $x(t) = rect((t+0.01)/0.001) + rect((t-0.01)/0.001)$
   e. $x(t) = rect(t/0.001)\cos(2\pi f_c t)$ $f_c = 1Mhz$
   f. $x(t) = e^{\frac{-\pi t^2}{\tau^2}}$ for $\tau = 1ms, 10ms$

2. Find the inverse continuous time Fourier Transform of the following signals:
   a. $X(\omega) = 0.001 sinc(\frac{0.001\omega}{2})$
   b. $X(\omega) = 0.001 sinc(\frac{0.001(\omega+\omega_o)}{2}) + 0.001 sinc(\frac{0.001(\omega-\omega_o)}{2})$ where $\omega_o = \pi 2000000$
   c. $X(\omega) = \dfrac{10}{(3+j\omega)^2}$

3. Find the Fourier transform for $x(t) = \sum_{k=-\infty}^{\infty} rect(\frac{t-kT_0}{\tau})$ with $T_0 = .5ms$ and $\tau = 0.125ms$

4. Find and plot the Fourier transform of $x(t) = 200 sinc(10t) sinc(20t)$
   [Hint multiplication in the time domain is convolution if the frequency domain]

5. If x(t) is real and even then, the Fourier transform of x(t) is a real and even function, True or False.

6. If x(t) is a real and odd function then, the Fourier transform of x(t) is a real and even function, True or False.