EECS 360
Homework #9

1. Section 4.8 Participation Activities
   - 4.8.1: Time scaling property of the Fourier transform.
   - 4.8.2: Fourier transform time scaling.
   - 4.8.3: Fourier transforms of shifted impulse functions.
   - 4.8.4: Time shift property of the Fourier transform, and phase.
   - 4.8.6: Fourier transform pairs.
   - 4.8.7: Fourier transforms of step functions and exponentials.
   - 4.8.8: Deriving the Fourier transform modulation property, using the frequency-shift property.
   - 4.8.9: Fourier transform properties: derivative, modulation, and convolution.
   - 4.8.10: Reviewing Fourier transform properties.
2. Exercise 4.8.1
3. Exercise 4.8.5
4. Exercise 4.8.9
5. Section 4.9 Participation Activities
   - 4.9.1: Time-domain energy computations for non-periodic signals.
   - 4.9.2: Parseval's theorem and energy spectral density.
6. Exercise 4.9.2
7. Section 4.12 Participation Activities
   - 4.12.1: Fourier circuit analysis.
   - 4.12.2: RC circuit analysis via Fourier transform, with exponential input.
   - 4.12.3: RC circuit analysis via Fourier transform, for cosine input
8. Find the continuous time Fourier Transform (CTFT) and plot the magnitude of the continuous time Fourier Transform (CTFT) of the following signals:

   a. $10^6 \text{rect}\left(\frac{t}{\tau}\right)$ for τ=1μs and 10μs

   b. 10^6 $\text{tri}\left(\frac{t}{\tau}\right)$ for τ=1μs and 10μs

   c. $e^{\frac{-\pi t^2}{\tau^2}}$ for τ=1 and 10

   d. $\text{rect}(t/\tau)\cos(\omega_c t)$ for τ= 10μs and $\omega_c = 2 * \pi * 1$ MHz
9. Find the inverse continuous time Fourier Transform of the following signals:

   a. $0.001\ \text{sinc}\left(\frac{0.001\,\omega}{2}\right)$

   b. $\frac{0.001}{2}\left(\text{sinc}\left(\frac{0.001\,(\omega-\omega_c)}{2}\right)+\text{sinc}\left(\frac{0.001\,(\omega+\omega_c)}{2}\right)\right)$

   c. $\frac{6}{9+\omega^2}$
10. Find the Fourier transform of x(t) for τ=0.33ms and T_0 =1.0ms

$$x(t) = \sum_{k=-\infty}^{\infty} \text{rect}\left(\frac{t - \text{kT}_0}{\tau}\right)$$

11. Find and plot the Fourier transform of

$$x(t) = 200\ \text{sinc}(10\,\pi\text{t})\ \text{sinc}(20\,\pi\text{t})$$

[Hint multiplication in the time domain is convolution if the frequency domain]

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

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