EECS 361
Homework #2

1. Section 2.5 Participation activities
- 2.5.2: Unit step function.
- 2.5.4: Ramp function.
- 2.5.5: Triangle waveform synthesized from ramps.
- 2.5.6: Rectangular (rect) function.
- 2.5.8: Impulse function.
- 2.5.9: Sampling property of the impulse function.
- 2.5.10: Time-scaling of impulse function sampling integrals.
- 2.5.11: Exponential function.
- 2.5.12: Exponential functions.

2. Challenge activity
2.5.1: Nonperiodic waveforms 3.

3. Given x(t)=100u(t)$e^{\frac{-t}{50}}$ find how long it takes x(t) to be reduced to 50% of its peak value, that it find it half-life value.

4. Plot the following functions over a range of t from -10 to 10.

a. $x_1(t)$ = -4u(t+4)

b. $x_2(t)$ = -4u(t-4)

c. $x_1(t)$-$x_2(t)$

5. Solve the following.

a. $\int_{-\infty}^{\infty} \delta(\tau)\, e^{-2\tau}\, d\tau$

b. $\int_{-\infty}^{\infty} \delta(\tau - 0.2)\, u(\tau)\, e^{-2\tau}\, d\tau$

c. $\int_{-\infty}^{\infty} \delta(\tau - .8)\, u(\tau)\, e^{-2\tau}\, d\tau$

d. $\int_{-\infty}^{\infty} \delta(\tau - t)\, u(\tau)\, e^{-2\tau}\, d\tau$

6. Plot and compare these three signals. Explain their similarities and differences.
$x_1(t)$= 2cos(2π1000t), $x_2(t)$= $2\cos\left(2\pi 1000\left(t - \frac{1}{8000}\right)\right)$, $x_3(t)$= $2\cos\left(2\pi 50t - \frac{\pi}{4}\right)$

7. Let

$$x(t) = \sum_{k=-n}^{n} 6\,\mathrm{rect}\left(\frac{t - 4k}{2}\right) - 3$$

a. For n=2 plot x(t)
b. Sketch x(t) as n⟶∞, in this case is x(t) periodic, if so what is the period.

8. Plot

$$x(t) = \sum_{n=1}^{5} \frac{1}{n\pi} \sin(2\pi nt) \text{ for } -3<t<3$$

9.

a. Given a sequence of 4 bits are represented by voltage levels a_i= {1, -1, 1, -1};
plot a binary signal x(t),

$$x(t) = \sum_{n=1}^{4} a_n\,\mathrm{rect}(t - n + 0.5)$$

b. Binary Phase Keyed (BPSK) modulation is used to modulate binary information onto a radio frequency (RF carrier. A BPSK signal is given as $x(t)\cos(2\pi f_c t)$. Plot

$$x_{\mathrm{RF-BPSK}}(t) = \sum_{n=1}^{4} a_n \,\mathrm{rect}(t - n + 0.5)\cos(2\pi 3t)$$

c. A modulation using amplitude shift keying (ASK) signal is generated by changing a_i to $b_i = \{1, 0, 1, 0\}$. Plot

$$x_{\mathrm{RF-ASK}}(t) = \sum_{n=1}^{4} b_n \,\mathrm{rect}(t - n + 0.5)\cos(2\pi 3t)$$

10. Plot for -4<t<4

a. $\frac{\sin(\pi t)}{\pi t}$ (L'Hôpital's rule can be used to show that $\frac{\sin(\pi t)}{\pi t}|_{t=0}=1$)

b. $\frac{\sin(2\pi t)}{2\pi t}$