EECS 360
Homework #4
Spring 2021
Signal Manipulations

1. Plot

   $x_1(t) = 10\cos(2\pi 1000t)$, $x_2(t) = 10\cos(2\pi 1000(t - 62.5\mu s))$, and $x_3(t) = 10\cos(2\pi 1000t - \frac{\pi}{8})$

   Compare these three signals and explain their similarities and differences.

2. Plot

   a. $x(t) = \sum_{i=-n}^{n} 2rect(\frac{t-i}{0.25}) \quad n = 2$

   b. Sketch x(t) as n→∞

3. A Binary Phase Keyed (BPSK) modulation is used to modulate binary information onto a radio frequency (RF) carrier. Given a set of information bits b_i = {-1, 1, -1, 1}. A modulated RF signal is $y(t) = \sum_{i=1}^{4} b_i rect(t - i - .5)\cos(2\pi 12t)$ Plot y(t) for 0<t<4.

   Repeat for b_i = {1, 0, 1, 0} (This an example of modulation using on-off keying).

4. Plot $\frac{1}{2} + \sum_{n=1}^{5} \frac{1}{n\pi}\sin(2\pi nt)$ for -3<t<3

5. Plot the magnitude |X(f)| and phase angle of the following complex function for -1 <f< 1

   $X(f) = 2rect(f)e^{-j4\pi f}$

6. For a sequence of information bits d_k ={1,0,1,1,1,0}; k=0….5 a message signal *m(t)* is formed as shown below, here let with τ = 1ms. Plot the message signal *m(t)* for 0<t<7ms.

   $$m(t) = \sum_{k=0}^{5} d_k rect[\frac{t - \frac{(2k+1)\tau}{2}}{\tau})]$$