EE 2000 Assignment # 2

(taken from Dr. Jingxian Wu, University of Arkansas, 2020.)

1. Let
$$x(t) = \begin{cases} 2t+2, & -1 \le t < 0 \\ 2t-2, & 0 \le t < 1 \end{cases}$$
   (a) sketch $x(t)$
   (b) sketch $x(t-2), x(t+3), x(-3t-2)$ and $x\left(\frac{2}{3}t+\frac{1}{2}\right)$ and find the analytical expressions for these functions.

2. The rectangular signal $x(t) = p_2(t) = \begin{cases} 1/2, & -1 < t < 1 \\ 0, & \text{o.w.} \end{cases}$ is transmitted through the atmosphere and is reflected by different objects located at different distances. The received signal is
$$y(t) = x(t) + 0.5x(t - \frac{T}{2}) + 0.25x(t-T), T \gg 2 \quad (1)$$
   Sketch $y(t)$ for $T = 10$.

3. Sketch the following signals
   (a) $x_1(t) = u(t) + 5u(t-1) - 2u(t-2)$
   (b) $x_2(t) = r(t) - r(t-1) - u(t-2)$
   (c) $x_3(t) = x_1(2t+4)$

4. Evaluate the following integrals:
   (a) $\int_{-\infty}^{\infty} \left(\frac{2}{3}t - \frac{3}{2}\right) \delta(t-1)dt$
   (b) $\int_{-\infty}^{\infty} (t-1)\delta\left(\frac{2}{3}t - \frac{3}{2}\right) dt$
   (c) $\int_{-3}^{2} [\exp(-t+1) + \sin(2\pi t/3)]\delta(t-3/2)dt$
   (d) $\int_{-3}^{-2} [\exp(-t+1) + \sin(2\pi t/3)]\delta(t-3/2)dt$