1. For each $x(t)$ shown in Figure 1 on the next page of this assignment, express $x(t)$ as a linear combination of (shifted) steps and ramps.

2. Use MATLAB to plot the following functions for $-2 \leq t \leq 6$ sec. Label your axes appropriately. Submit both the plots and also a single m-file containing the MATLAB commands you used to create the plots.

   (a) $x(t) = \begin{cases} 
   1, & 0 \leq t < 2 \\
   -\frac{1}{2}t + 2, & 2 \leq t < 4 \\
   0, & \text{otherwise}
   \end{cases}$
   
   (b) $x(t) = 3e^{-t}\cos(2t)u(t)$
   
   (c) $x(t) = 2\sin(3t - \pi/2) - \cos(2t)$

3. Sketch the following continuous-time signals.

   (a) $x(t) = 2u(t + 1) - 4u(t) + 3u(t - 1) - u(t - 2)$
   
   (b) $x(t) = r(t + 2) - 2r(t) + 2r(t - 4) + 2u(t - 4)$
   
   (c) $x(t) = r(t + 2) - 4u(t + 2) + r(t) - 2u(t) - 2r(t - 2)$
   
   (d) $x(t) = (t + 2)u(t + 2) - 2t u(t) + (2t - 4 + 2)u(t - 4)$
   
   (e) $x(t) = (t - 2)u(t + 2) + (t - 2)u(t) + (-2t + 4)u(t - 2)$

4. Use MATLAB to plot the signals in the previous problem.

5. Sketch the following discrete-time signals.

   (a) $x[n] = 2u[n] - 3u[n - 1] + u[n - 3]$  
   (b) $x[n] = (n + 2)u[n + 2] - 3u[n] - (n + 1)u[n - 2]$  
   (c) $x[n] = \delta[n + 2] - \delta[n + 1] + 2\delta[n] + u[n - 1] - u[n - 2]$  

6. Use MATLAB to plot

   $$x(t) = t^3 + 3t$$

   together with its “step approximation” $x_s(t)$ and “ramp approximation” $x_r(t)$ over the range of time $-3 \leq t \leq 3$, where $x_s(t)$ and $x_r(t)$ are given by

   $$x_s(t) = \sum_k a_k u(t - kT)$$

   $$x_r(t) = \sum_k b_k r(t - kT)$$

   and first $T = 0.2$ and then second $T = 1$. 
Figure 1: Plots for problem 1.