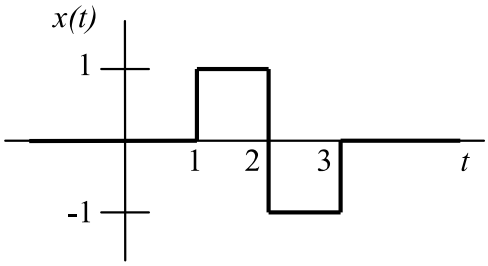
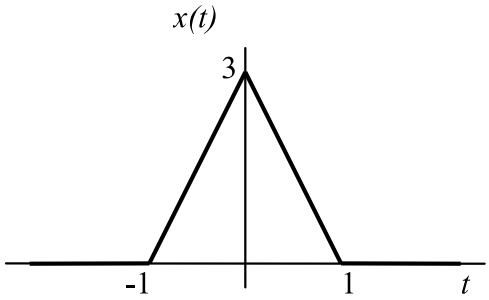
Signals and System: Homework 1

1. Determine an expression for the following signals. Simplify your answer.



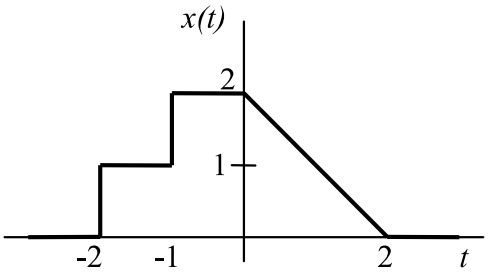
(a)



(b)

2. Sketch the following continuous-time signals.
   a. $x(t) = u(t+2) + u(t-3)$
   b. $x(t) = 5u(-2t+6)$
   c. $x(t) = (3t+1)(u(t-2) - u(t-4))$
   d. $x(t) = e^{t}(u(t-1) - u(t-2))$

3. A continuous-time signal, *x(t)*, is shown below. Sketch each of the following signals.



   a. $y(t) = x(t-1)$
   b. $y(t) = x(2-t)$
   c. $y(t) = x(2t+1)$
   d. $y(t) = x\left(4 - \frac{t}{2}\right)$
   e. $y(t) = (x(t) + x(-t))u(t)$
   f. $y(t) = x(t)\left(\delta\left(t + \frac{3}{2}\right) - \delta\left(t - \frac{1}{2}\right)\right)$

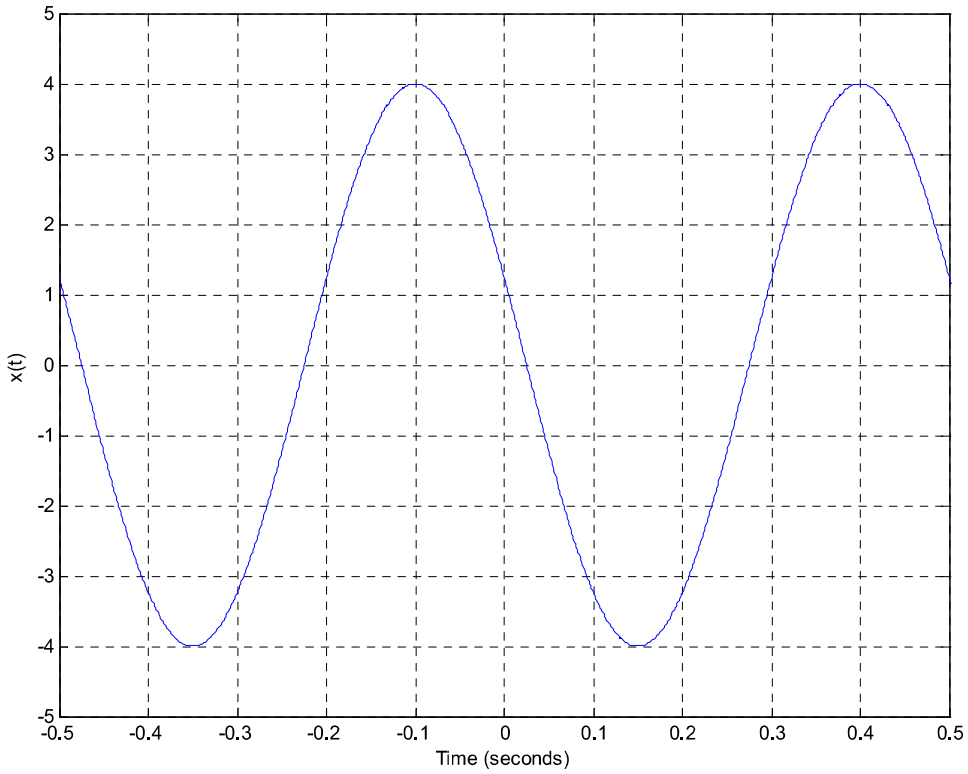
4. Determine whether or not the following continuous-time signals are periodic. If the signal is periodic, determine what the fundamental frequency is.

   a. $x(t) = 5\sin\left(4t - \frac{\pi}{6}\right)$

   b. $x(t) = e^{\cos(t)}$

   c. $x(t) = te^{\cos(t)}$

5. For the following waveform, determine the amplitude, period, frequency, time shift, and phase delay. Write an expression for the waveform.



6. Sketch the following discrete-time signals.

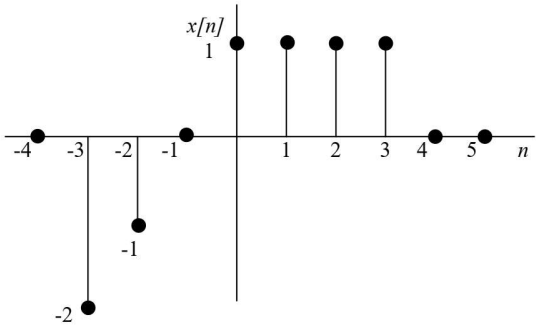
   a. $x[n] = u[n-5] - u[n-6]$

   b. $x[n] = 10u[-n+2] - 5u[n-2]$

   c. $x[n] = 4\delta[n+5] + (n+5)u[n+3] - nu[n]$

   d. $x[n] = (0.1)^n (u[n] - u[n-5])$

7. A discrete-time signal, *x[n]*, is shown below. Sketch each of the following signals.



   a. $y[n] = x[n-3]$

   b. $y[n] = x[3-n]$

   c. $y[n] = x[3n]$

   d. $y[n] = x[3n+1]$

   e. $y[n] = x[n]u[3-n]$

   f. $y[n] = x[n-2]\delta[n-2]$

   g. $y[n] = x\left[(n-1)^2\right]$