ECE351: Signals and Systems I - Fall 2023 - Dr. Thinh Nguyen
Homework 3
Due 10/18/2023

1. Evaluate the following discrete-time convolution

   (a) $y[n] = \frac{1}{4}^n u[n] * u[n+2]$

   (b) $y[n] = (-1)^n * 2^n u[-n+2]$

   (c) $y[n] = \beta^n u[n] * \sum_{m=0}^{\infty} \delta[n-4m]$

2. Evaluate the following continuous-time convolution

   (a) $y(t) = e^{-\gamma t} u(t) * (u(t+2) - u(t))$

   (b) $y(t) = e^{-\gamma t} u(t) * e^{\beta t} u(-t)$

   (c) $y(t) = e^{-\gamma t} u(t) * \sum_{m=0}^{\infty} \frac{1}{4}^m \delta(t-m)$

3. Consider the discrete-time signals depicted in Fig. 1. Evaluate the following convolution sums:
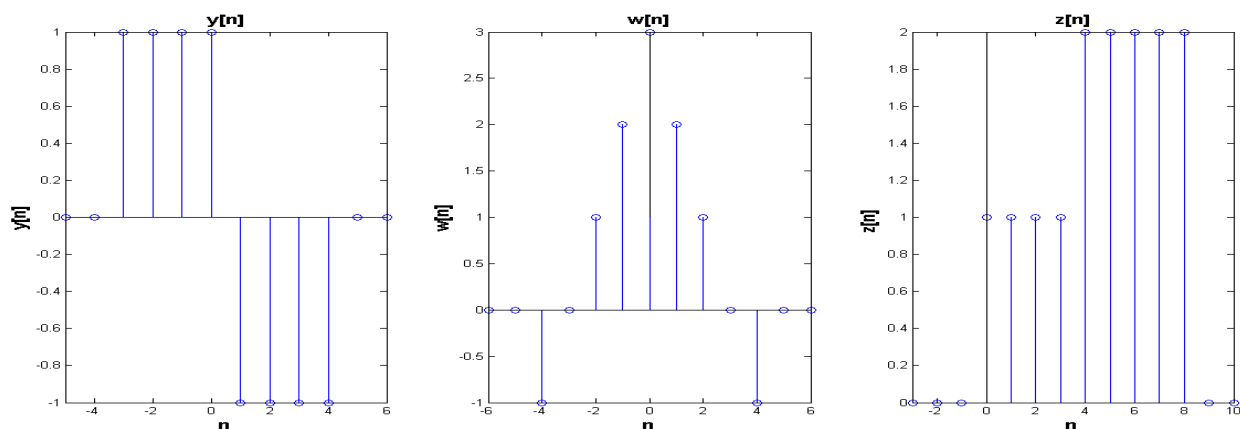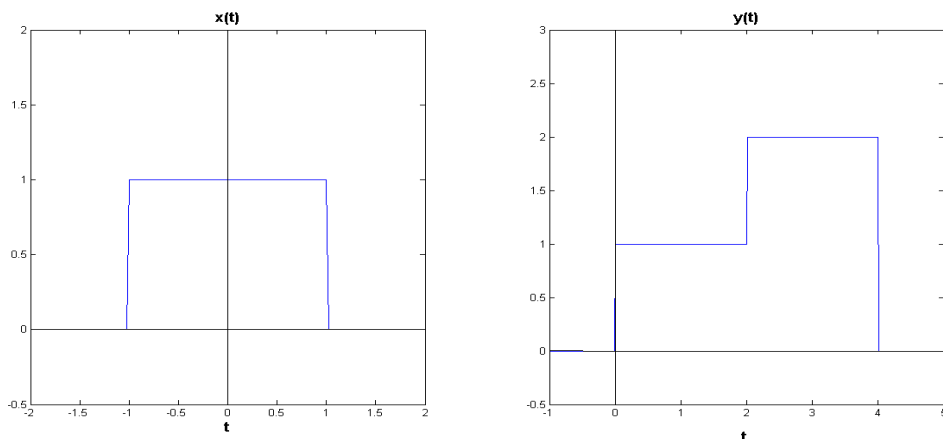

Figure 1: Figures for the discrete time signals to be used in problem 3

   (a) $m[n] = y[n] * z[n]$

   (b) $m[n] = y[n] * w[n]$

4. Consider the continuous-time signals depicted in Fig. 2. Evaluate the following convolution integrals:
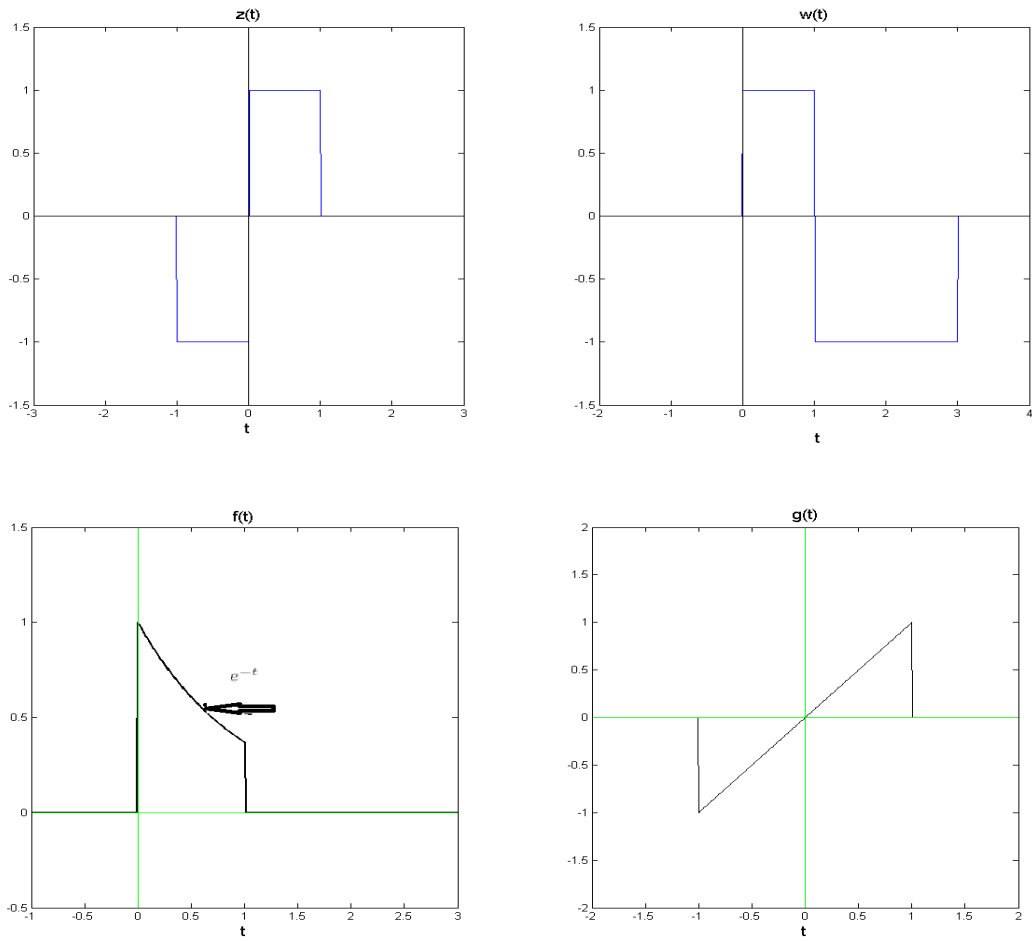
Figure 2: Figures for the continuous time signals to be used in problem 4

   (a) $m(t) = x(t) * y(t)$

   (b) $m(t) = x(t) * z(t)$

   (c) $m(t) = y(t) * w(t)$

   (d) $m(t) = z(t) * f(t)$

5. For each of the following impulse responses, determine whether the corresponding system is memoryless, causal, stable

   (a) $h(t) = \cos(\pi t)$

   (b) $h(t) = e^{-2t}u(t-1)$

   (c) $h[n] = \cos(\frac{\pi}{8})\{u[n] - u[n-10]\}$

   (d) $h[n] = \sum_{p=-1}^{\infty} \delta[n-2p]$