ECE351: Signals and Systems I - Fall 2023 - Dr. Thinh Nguyen
Homework 8
Due 12/06/2023

1. Let

$$h(t) = \frac{\sin(11\pi t)}{\pi t},$$

$$x(t) = \sum_{k=1}^{\infty} \frac{1}{k^2} \cos(k5\pi t),$$

$$g(t) = \sum_{k=1}^{10} \cos(k8\pi t).$$

Use FT to determine $y(t)$ shown in Fig. 1

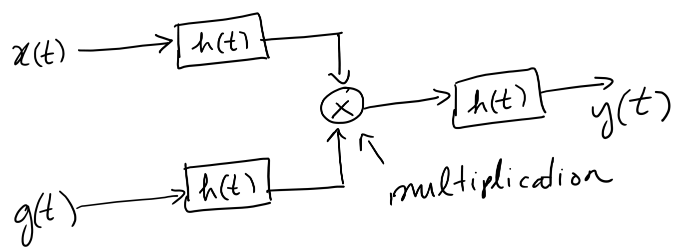

Figure 1: Problem 1

2. The continuous-time signal $x(t)$ with FT as depicted in Fig. 2.

   (a) Sketch the FT of the sampled signal for the following sampling intervals: $T_s = \frac{1}{14}, T_s = \frac{1}{7}, T_s = \frac{1}{5}$. In each case, identify whether aliasing occurs.

   (b) Let $x[n] = x(nT_s)$. Sketch the DTFT of $x[n]$ for each sampling intervals in (a)

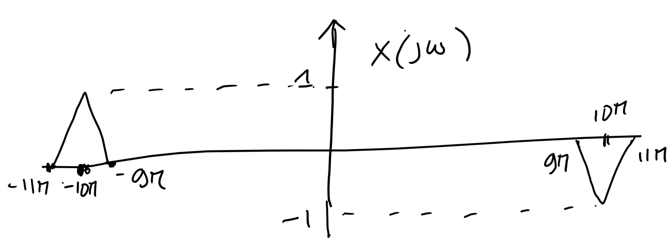

Figure 2: Problem 2

3. For each of the following signals, sampled with sampling interval T_s, dtermine the bounds on T_s, which guarantee that there will be no aliasing.

   (a) $x(t) = \frac{1}{t}\sin(3\pi t) + \cos(2\pi t)$

   (b) $x(t) = \cos(12\pi t)\frac{\sin(\pi t)}{2t}$

   (c) $x(t) = e^{-6t}u(t) * \frac{\sin(Wt)}{\pi t}$

   (d) $x(t) = w(t)z(t)$ where the FT's $W(j\omega)$ and $Z(j\omega)$ are depicted in Fig. 3

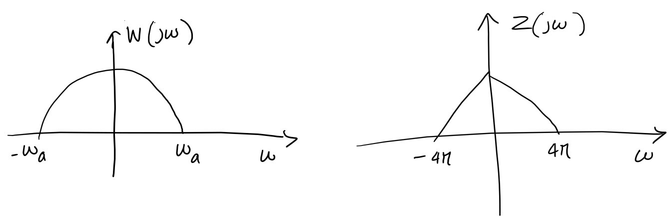

Figure 3: Problem 3