

Homework Assignment 1

Due: 16:00pm Tuesday, Feb. 7, 2023

程序代写代做 CS编程辅导

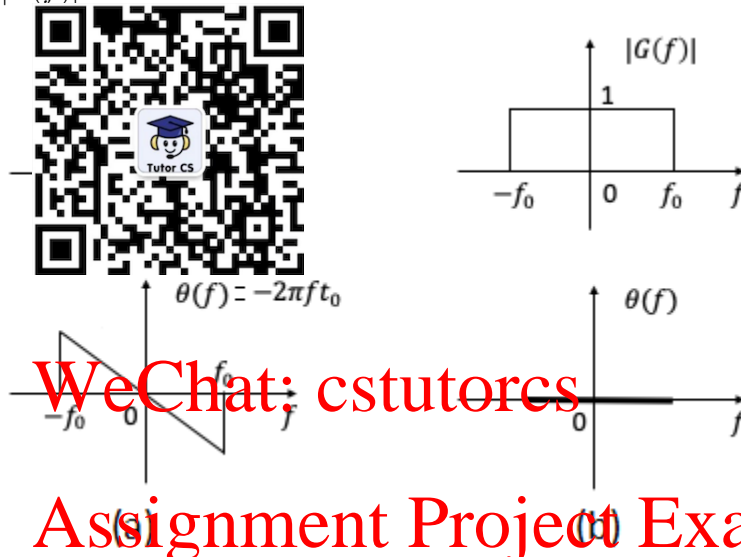
Problem 1. Find the inverse Fourier transforms of $G(f)$ for the spectra in Figure 1 (a) and (b).Note: $G(f) = |G(f)|e^{j\angle G(f)}$.

Figure 1: Signals for Problem 1.

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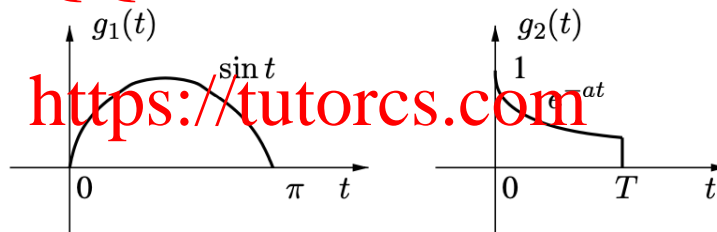
Problem 2. Find the Fourier transforms of the signals $g_1(t)$ and $g_2(t)$ in Figure 2 using either the definition of Fourier Transform or the properties of Fourier Transform together with the table of Fourier transform pairs posted on the course website.

Figure 2: Signals for Problem 2.

Problem 3. a) Prove the following result via properties of Fourier transform: For any signal $g(t)$ with Fourier transform $G(f)$, we have

$$g(t) \sin(2\pi f_c t) \Leftrightarrow \frac{1}{2j} [G(f - f_c) - G(f + f_c)].$$

b) Using the result in (a), please find the Fourier transform of the time-domain signal

$$s(t) = [2 + \cos(2\pi f_0 t)] \sin(200\pi t),$$

where $f_0 > 0$. Draw the spectra.Note: Consider different ranges of f_0 .

Problem 4. (Haykin & Moher Problem 2.20 with revision) Any function $g(t)$ can be split unambiguously into an even part, $g_e(t)$, and an odd part, $g_o(t)$, as shown by

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$$g(t) = g_e(t) + g_o(t),$$

where



$$g_e(t) = \frac{1}{2} [g(t) + g(-t)], \quad g_o(t) = \frac{1}{2} [g(t) - g(-t)].$$

- a) Evaluate the even part $g_e(t)$.
b) What are the Fourier transforms of these two parts and the Fourier transform of $u(t)$?

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