

November 17, 1998  
Midterm Exam II  
EE 3302: Signals and Systems

NOTE: Please, complete the following table and keep record of your assignment number.

First Name	
Last Name	
Student ID	
Assignment #	0

**Exercise 1.** Consider the continuous-time signal

$$x(t) = \begin{cases} \cos(\omega_0 t) & |t| < \pi/\omega_0 \\ 0 & \text{otherwise} \end{cases}$$

where  $\omega_0$  is a positive frequency.

A) Evaluate the Fourier Transform of  $x(t)$  [pt. 15].

**Exercise 2.** A continuous-time signal  $x(t)$  has the following spectrum

$$X(j\omega) = a\delta(\omega - 1) + jb\delta(\omega - 2) + a\delta(\omega + 1) - jb\delta(\omega + 2)$$

where  $a$  and  $b$  are real values.

A) Evaluate  $x(t)$  [pt. 10].

**Exercise 3.** Consider the signal  $x(t)$  shown in Fig. 1.

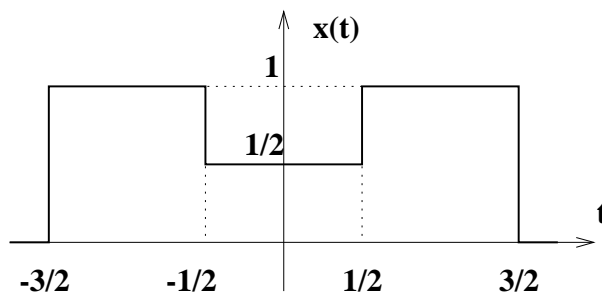


Figure 1: Periodic signal  $x(t)$ .

A) Evaluate the Fourier Transform of  $x(t)$  [pt. 15].

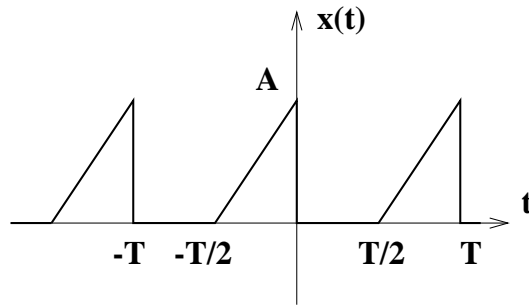


Figure 2: Periodic signal  $x(t)$ .

**Exercise 4.** Consider the periodic signal  $x(t)$  shown in Fig. 2.

- A) Determine the fundamental period of  $x(t)$  and the coefficients of the Fourier series of  $x(t)$  [pt. 15].

**Exercise 5.** An impulse signal  $\delta(t)$  is sent to the input of a system whose frequency response is

$$H(j\omega) = \begin{cases} 1 - |\omega| & |\omega| < 1 \\ 0 & \text{otherwise} \end{cases}$$

- A) Calculate the energy of the output signal [pt. 15].

**Exercise 6.** Consider the periodic signal shown in Fig. 3.

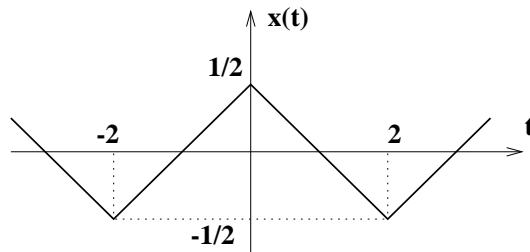


Figure 3: Periodic signal  $x(t)$ .

- A) Determine the fundamental period of  $x(t)$  and the coefficients of the Fourier series of  $x(t)$  [pt. 15].

**Exercise 7.** Let  $X(j\omega)$  be the Fourier Transform of

$$x(t) = \frac{1}{a + t^2}$$

where  $a$  is a positive real value.

- A) Calculate

$$\int_{-\infty}^{+\infty} j\omega X(j\omega) d\omega$$

[pt. 15].