

5. If $x[n]$ has fundamental period N_o , an even integer, and discrete-time Fourier series coefficients X_k , what are the Fourier series coefficients for

(a) $\hat{x}[n] = x[n + N_o / 2]$

(b) $\hat{x}[n] = (-1)^n x[n]$ (Assume that $\hat{N}_o = N_o$ and give an example to show why this assumption is needed.)

1. From the basic definition, compute the Fourier transforms of the signals

(a) $x(t) = e^{-(t-2)} u(t-3)$

(b) $x(t) = e^{-|t+1|}$

(c) $x(t) = \begin{cases} 0, & t \leq 0 \\ 2, & 0 < t < 1 \\ 2e^{-(t-1)}, & t \geq 1 \end{cases}$

(d) $x(t) = \sum_{k=0}^{\infty} a^k \delta(t-k), \quad |a| < 1$

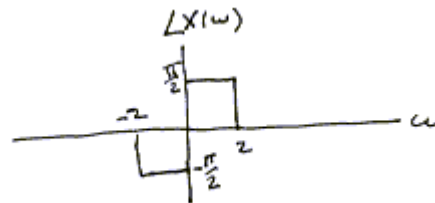
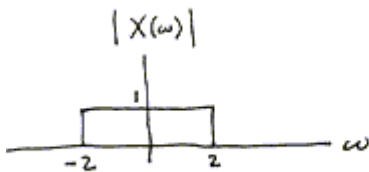
2. From the basic definition, compute the signals corresponding to the Fourier transforms

(a) $X(\omega) = 2\pi e^{-|\omega|}$

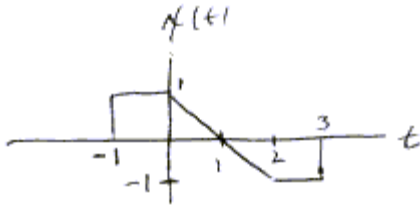
(b) $|X(\omega)| = \begin{cases} 2\pi, & -2 \leq \omega \leq 2 \\ 0, & \text{else} \end{cases} \quad \angle X(\omega) = \begin{cases} -\omega, & -2 \leq \omega \leq 2 \\ 0, & \text{else} \end{cases}$

(c) $X(\omega) = e^{-\omega} u(\omega)$

(d) $X(\omega)$ specified by the sketches below:



4. By inspection of the defining formulas for the Fourier transform and inverse Fourier transform, that is, without computing the Fourier transform, evaluate the following quantities for the signal shown below.



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

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

(c) $X(0)$

6. A signal $x(t)$ has the Fourier transform

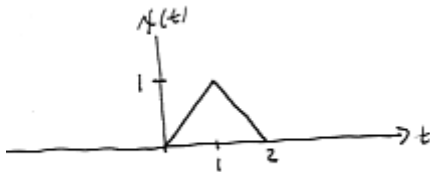
$$X(\omega) = \frac{3 - j\omega}{3 + j\omega}$$

(a) Sketch the magnitude spectrum of the signal.

(b) Sketch the phase spectrum of the signal

(c) Find the signal $x(t)$ by using the properties of the Fourier transform.

7. From the basic definitions and properties of the Fourier transform and inverse Fourier transform, answer the following questions about the transform of the signal shown below (without calculating the transform).



(a) What is $\angle X(\omega)$? (Hint: An even signal has a real Fourier transform.)

(b) What is $X(0)$?

(c) What is $\int_{-\infty}^{\infty} X(\omega) d\omega$?