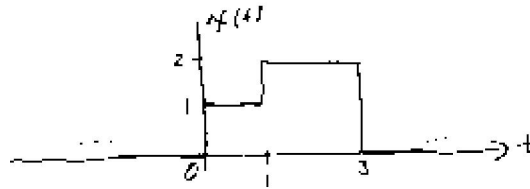


H2-08

1. Given the signal shown below,



sketch the signal  $y(t) =$

(a)  $x(t-1)u(1-t)$

(b)  $x(2t) + x(-3t)$

(c)  $x(3t-1)$

2. Determine if the following signals are power signals or energy signals, and compute the total energy or time-average power, as appropriate.

(a)  $x(t) = \sin(2t)u(t)$

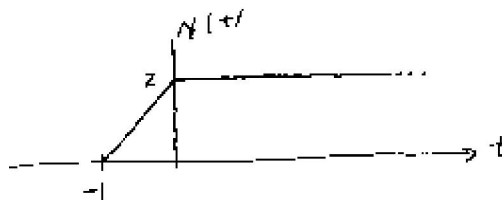
(b)  $x(t) = e^{-|t|}$

(d)  $x(t) = 5e^{-3t}u(t)$

3. For an energy signal  $x(t)$ , prove that the total energy is the sum of the total energy of the even part of  $x(t)$  and the total energy of the odd part of  $x(t)$ .

4. If a given signal  $x(t)$  has total energy  $E = 5$ , what is the total energy of the signal  $y(t) = 2x(3t-4)$ ?

5. Sketch the even and odd parts of this signal.



6. Determine which of the following signals are periodic, and specify the fundamental period.

(a)  $x(t) = e^{j\pi} \cos(2\pi t + \pi)$

(b)  $x(t) = \sin^2(t)$

(c)  $x(t) = \sum_{k=-\infty}^{\infty} u(t-2k) - u(t-1-2k)$

7. Suppose that  $x_1(t)$  and  $x_2(t)$  are periodic signals with respective fundamental periods  $T_1$  and  $T_2$ . Show that if there are positive integers  $m$  and  $n$  such that

$$\frac{T_1}{T_2} = \frac{m}{n},$$

then  $x(t) = x_1(t) + x_2(t)$  is periodic. If the condition holds, what is the fundamental period of  $x(t)$ ?

8. Determine which of the following signals are bounded, and specify a smallest bound.

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

(b)  $x(t) = -2te^{-3t} \sin(t^5)u(t)$

9. Determine whether the following signals are periodic; determine the fundamental period for those that are:

(a)  $x[n] = u[n] + u[-n]$

(b)  $x[n] = e^{-j3\pi n}$

(c)  $x[n] = (-1)^n + e^{j\frac{\pi}{2}n}$

10. Suppose  $x[n]$  is a discrete-time signal, and let  $y[n] = x[2n]$ .

(a) If  $x[n]$  is periodic, is  $y[n]$  periodic? If so, what is the fundamental period of  $y[n]$  in terms of the fundamental period of  $x[n]$ ?

(b) If  $y[n]$  is periodic, is  $x[n]$  periodic? If so, what is the fundamental period of  $x[n]$  in terms of the fundamental period of  $y[n]$ ?