EE103 HW#2 Assigned on Oct. 9, 2017

Prob. 1

2.19. Consider the trapezoidal pulse of Figure P2.19(a).

(a) Write a mathematical function for this waveform.

(b) Verify the results of Part (a), using the procedure of Example 2.12.

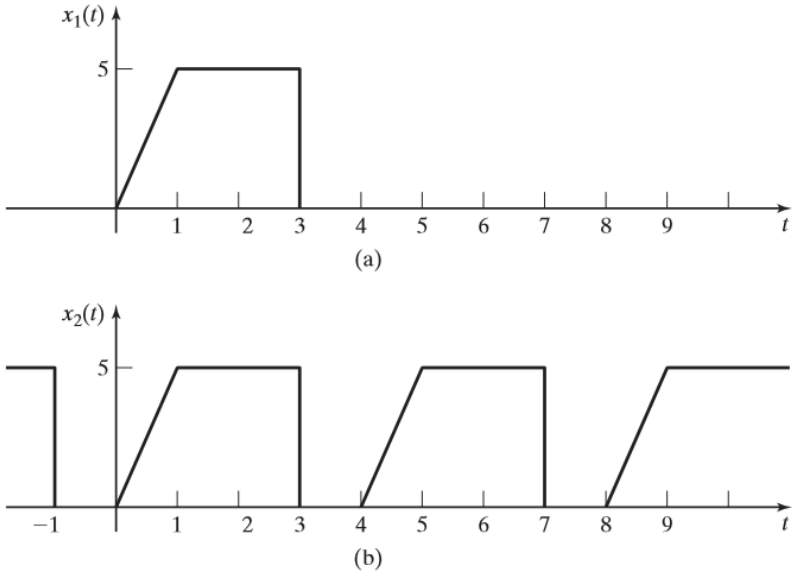


Figure P2.19

(c) Write a mathematical function for the waveform of Figure P2.19(b), using the results of Part (a).

Prob. 2

2.13. For each signal, if it is periodic, find the fundamental period T_0 and the fundamental frequency ω_0. Otherwise, prove that the signal is not periodic.

(a) $x(t) = \cos 3t + \sin 5t$.

(b) $x(t) = \cos 6t + \sin 8t + e^{j2t}$.

(c) $x(t) = \cos t + \sin \pi t$.

(d) $x(t) = x_1(t) + x_2(3t)$ where $x_1(t) = \sin(\frac{\pi t}{6})$ and $x_2(t) = \sin(\frac{\pi t}{9})$.

Prob. 3

2.27. **(a)** Determine whether the system described by

$$y(t) = \cos[x(t - 1)]$$

is

(i) memoryless, **(ii)** invertible,

(iii) causal, **(iv)** stable,

(v) time invariant, and **(vi)** linear.

(b) Repeat Part (a) for

$$y(t) = 3x(3t + 3).$$

(c) Repeat Part (a) for

$$y(t) = \ln[x(t)].$$

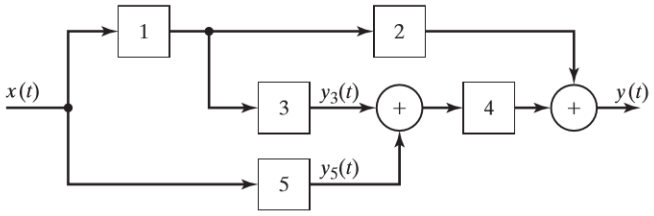
(d) Repeat Part (a) for

$$y(t) = e^{tx(t)}.$$

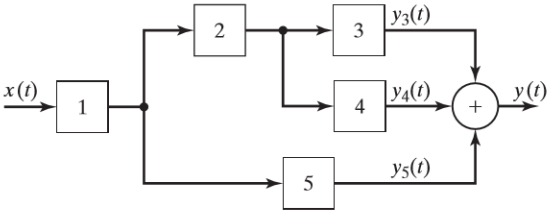
Prob. 4

2.23. **(a)** Express the output $y(t)$ as a function of the input and the system transformations, in the form of (2.56), for the system of Figure P2.23(a).

(b) Repeat Part (a) for the system of Figure P2.23(b).



(a)



(b)

Figure P2.23

(c) Repeat Part (a) for the case that the summing junction with inputs $y_3(t)$ and $y_5(t)$ is replaced with a multiplication junction, such that its output is the product of these two signals.

(d) Repeat Part (b) for the case that the summing junction with inputs $y_3(t)$, $y_4(t)$, and $y_5(t)$ is replaced with a multiplication junction, such that its output is the product of these three signals.

Prob. 5

3.6. A continuous-time LTI system has the input $x(t)$ and the impulse response $h(t)$, as shown in Figure P3.6. Note that $h(t)$ is a delayed function.

(a) Find the system output $y(t)$ for only $4 \leqq t \leqq 5$.

(b) Find the maximum value of the output.

(c) Find the ranges of time for which the output is zero.

(d) Solve for and sketch $y(t)$ for all time, to verify all results.

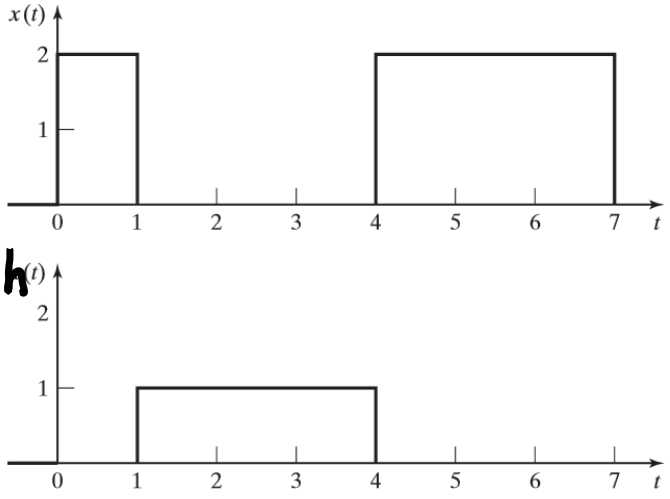


Figure P3.6