or the system of Figure P3.2(a), suppose that $x(t)$ and $h(t)$ are identical and as shown Figure P3.6.

) Find the output $y(t)$ only at the times $t = 0$, 1, 2, and 2.667. Solve this problem by inspection.

) To verify the results in Part (a), solve for and sketch $y(t)$ for all time.

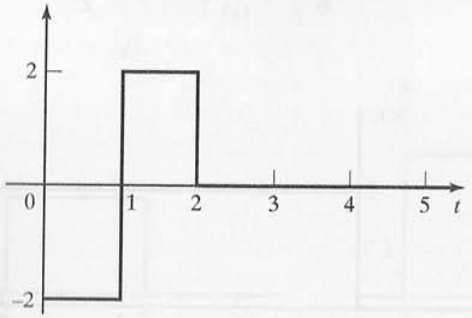


Figure P3.6

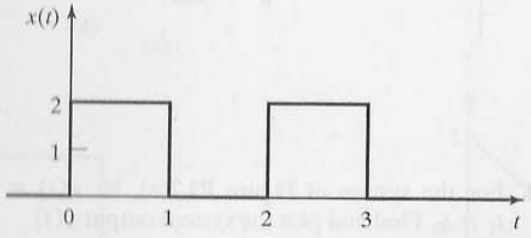
continuous-time LTI system has the input $x(t)$ and the impulse response $h(t)$, as own in Figure P3.7. Note that $h(t)$ is a delayed function.

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

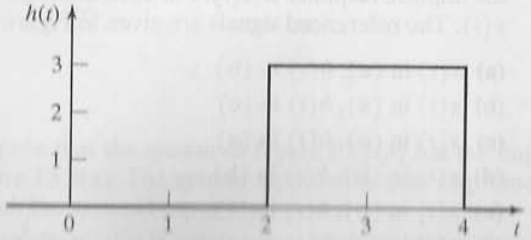
Find the maximum value of the output.

Find the ranges of time for which the output is maximum.

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



(a)



(b)

Figure P3.7

3.8. For the system of Figure P3.2(a), the input signal is $x(t)$, the output signal is $y(t)$, the impulse response is $h(t)$. For each of the following cases find $y(t)$:

(a) $x(t) = e^{t}u(-t)$ and $h(t) = 2u(t) - u(t-1) - u(t-2)$.
(b) $x(t) = u(1-t), h(t) = e^{-t}u(t-1)$.
(c) $x(t) = u(-t), h(t) = e^{-t}[u(t) - u(t-400)]$.
(d) $x(t) = e^{-t}u(t), h(t) = u(t-1) - u(t-3)$.
(e) $x(t) = e^{-at}[u(t) - u(t-2)]$ and $h(t) = u(t-2)$.
(f) $x(t) = e^{t}u(-t), h(t) = 2u(1-t)$.

3.9. Find $x_1(t)*x_2(t)$, where

$$x_1(t) = 2u(t+2) - 2u(t-2)$$

and

$$x_2(t) = \begin{cases} 0, & t < -4 \\ e^{-|t|}, & -4 \leq t \leq 4 \\ 0, & t > 4. \end{cases}$$

Section 3.3

3.10. Show that the convolution of three signals can be performed in any order by showing that

$$[f(t)*g(t)]*h(t) = f(t)*[g(t)*h(t)].$$

(*Hint*: Form the required integrals, use a change of variables. In one approach to the problem, the function

$$\int_{-\infty}^{\infty} g(\tau)\left[\int_{-\infty}^{\infty} h(t-\tau-\sigma)f(\sigma)\,d\sigma\right]dt$$

appears in an intermediate step.)

3.11. **(a)** Consider the two-LTI system cascaded in Figure P3.11. The impulse response of the two systems are identical, with $h_1(t) = h_2(t) = e^{-t}u(t)$. Find the impulse response of the total system.
(b) Repeat Part (a) for the case that $h_1(t) = h_2(t) = \delta(t)$.
(c) Repeat Part (a) for the case that $h_1(t) = h_2(t) = \delta(t-1)$.
(d) Repeat Part (a) for the case that $h_1(t) = h_2(t) = u(t-2) - u(t-4)$.

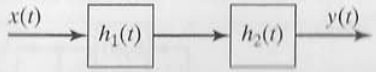


Figure P3.11

3.12. Consider the LTI system of Figure P3.12.

(a) Express the system impulse response as a function of the impulse responses of subsystems.