Laboratorio 1 de Analisis de Señales y Sistemas

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Sea $f(t) = u(t) - u(t-3)$ la señal pulso rectangular , $g(t) = e^{-2t}u(t), 0 \leq t \leq 5$ la amortiguacion exponencial y sea $h(t)$ la señal pulso triangular definida asi :

$$h(t) = \begin{cases} 0 & si \quad t \leq 0 \\ t & si \quad 0 < t < 1 \\ 2-t & si \quad 1 < t < 2 \\ 0 & si \quad t < 2 \end{cases}$$

Usando el MATLAB grafique las señales en tiempo continuo $f(t), g(t), h(t)$
Encuentre en terminos de de t y de la señal escalon unitario las siguientes convoluciones: $f(t) * g(t), f(t) * h(t), g(t) * h(t)$
Usando el matlab y el comando *conv* grafique las convoluciones $f(t) * f(t),\ f(t) * g(t),\ g(t) * g(t),\ g(t) * h(t),\ h(t) * h(t)$.

funcion f(t)=u(t)-u(t-3)=rectpuls(t-1.5)

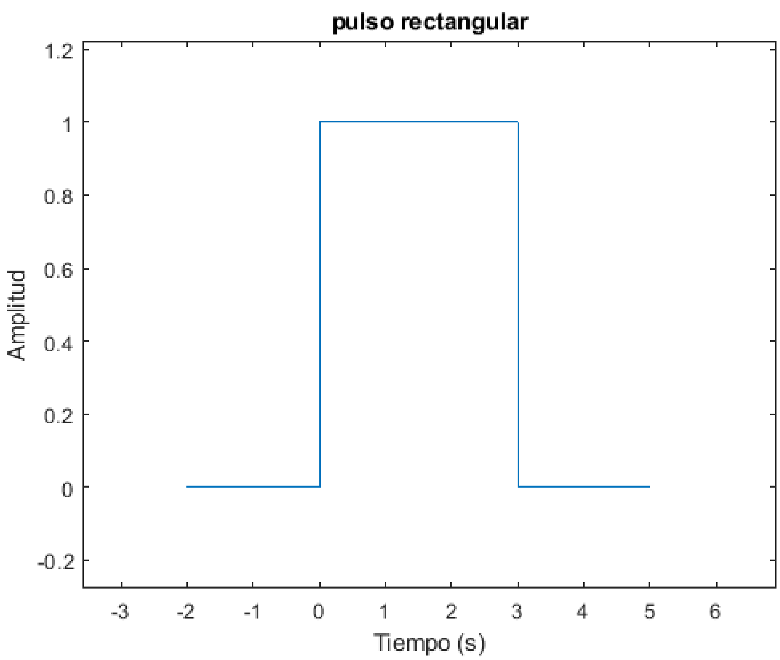

Figure 1: grafica de la funcion f(t)

funcion $g(t) = e^{-2t}u(t)$

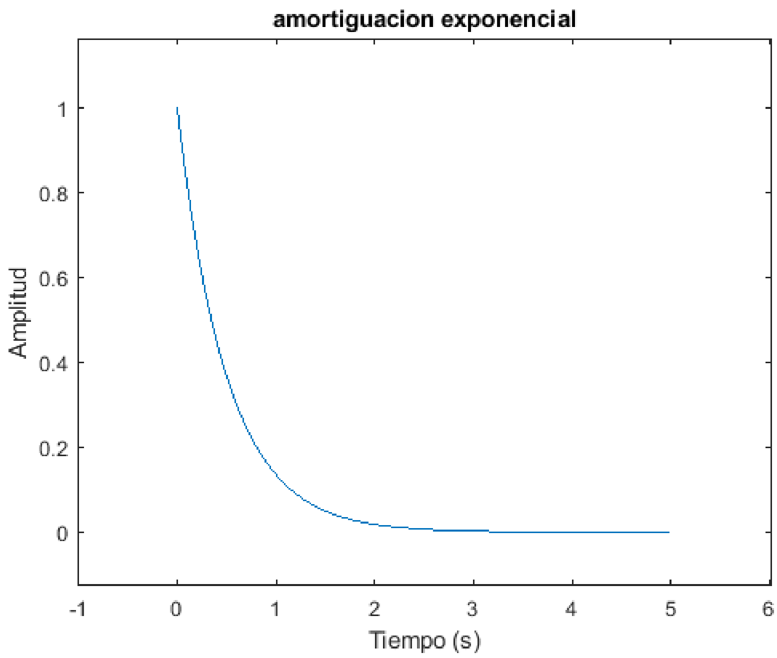

Figure 2: grafica de la funcion g(t)

funcion $h(t) = \ tripuls(t-1) \ = u_1(t) - 2u_1(t-1) + u_1(t-2)$

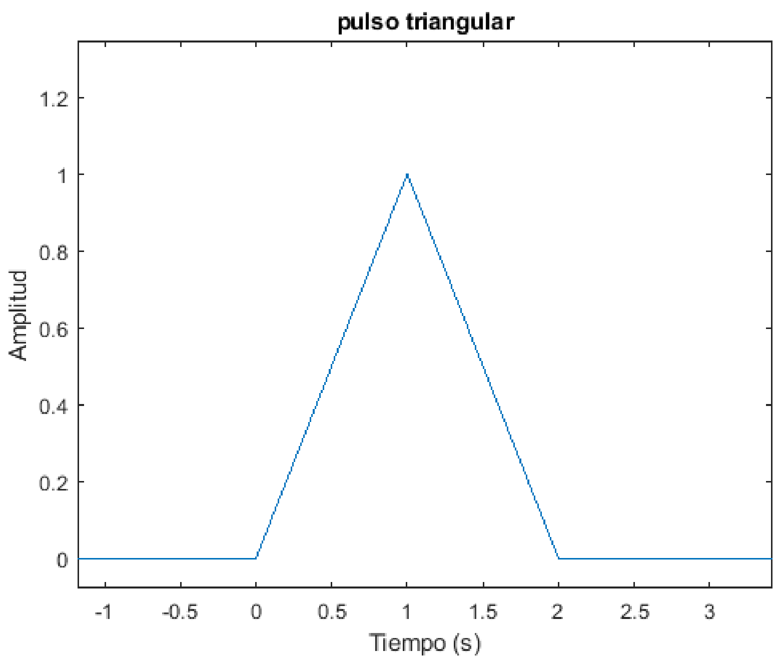

Figure 3: grafica de la funcion g(t)

Ahora hallaremos las convoluciones de $f(t) * g(t), f(t) * h(t), g(t) * h(t)$

$f(t) * g(t)= \int_{-\infty}^{\infty} g(\tau)f(t-\tau)d\tau$

Para $t < 0$

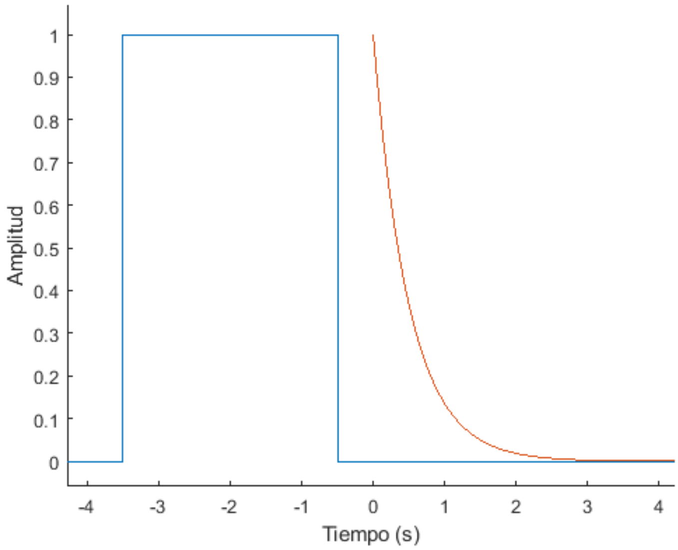

Figure 4: para valores de $t \ < 0$

Vemos que las graficas no se interceptan , por lo tanto $\int_{-\infty}^{\infty} g(\tau)f(t-\tau)d\tau = 0$

Para $0 < t < 3$

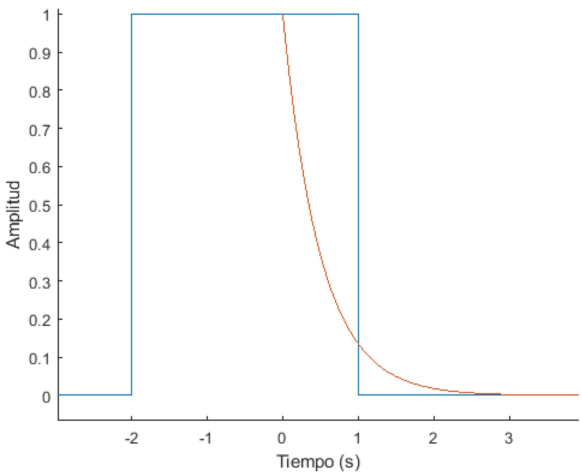

Figure 5: grafica en $0 < t < 3$

$\int_{-\infty}^{\infty} g(\tau)f(t-\tau)d\tau = \int_{0}^{t} e^{-2t}.1d\tau = \dfrac{1}{2} - \dfrac{e^{-2t}}{2}$

Para $3 < t < 5$

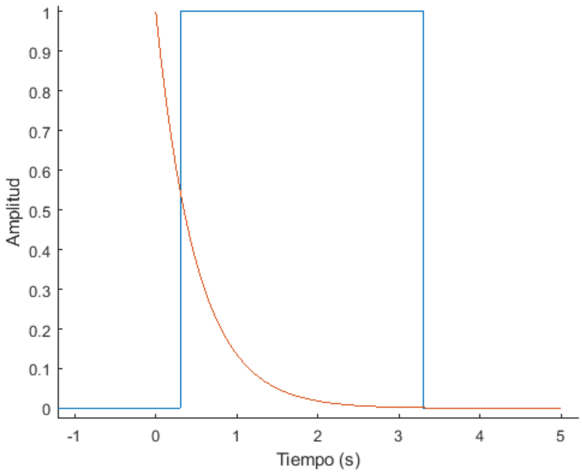

Figure 6: grafica en $3 < t < 5$

$\int_{-\infty}^{\infty} g(\tau)f(t-\tau)d\tau = \int_{-3+t}^{t} \; e^{-2t}.1d\tau = \; \dfrac{e^{-2t+6}}{2} - \dfrac{e^{-2t}}{2}$

Para $5 < t < 8$

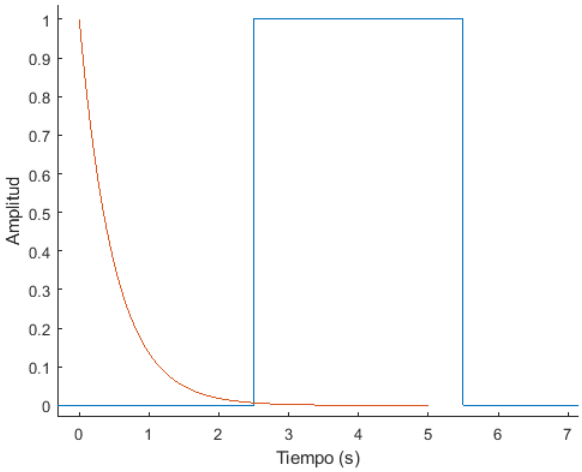

Figure 7: grafica en $5 < t < 8$

$\int_{-\infty}^{\infty} g(\tau)f(t-\tau)d\tau = \int_{-3+t}^{5} \; e^{-2t}.1d\tau = \; \dfrac{e^{-2t+6}}{2} - \dfrac{e^{-10}}{2}$

Para $8 < t$

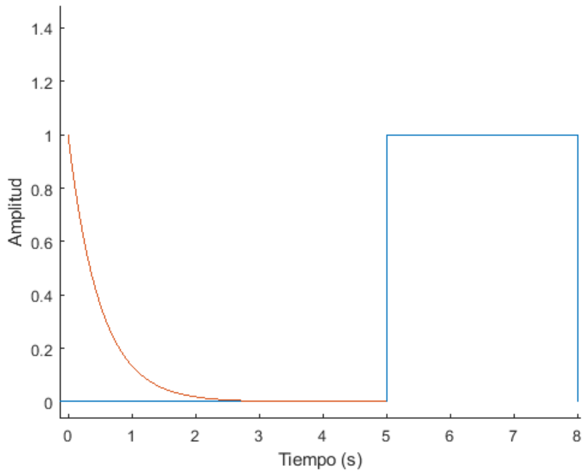

Figure 8: grafica en $5 < t < 8$

$\int_{-\infty}^{\infty} g(\tau)f(t-\tau)d\tau = \int_{8}^{\infty} \ e^{-2t}.1d\tau = 0$

la grafica de $f(t) * g(t)$ es

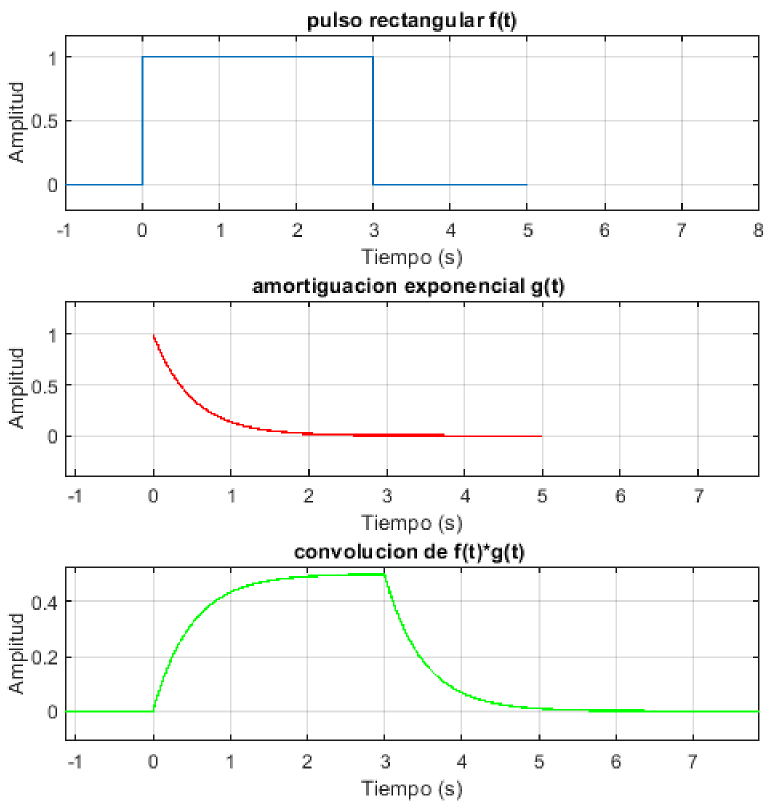

Figure 9: convolucion de $f(t) * g(t)$

$f(t) * h(t) = \int_{-\infty}^{\infty} h(\tau) f(t-\tau) d\tau$

sabemos que :

$u_n(t) * u_m(t) = u_{n+m+1}(t)$
$u_n(t-a) * u_m(t-b) = u_{n+m+1}(t-a-b)$

$f(t) = rectpuls(t-1.5) \ = u_0(t) - u_0(t-3)$
$h(t) = tripuls(t-1) \ = u_1(t) - 2u_1(t-1) + u_1(t-2)$

$f(t) * h(t) = (u_0(t) - u_0(t-3)) * (u_1(t) - 2u_1(t-1) + u_1(t-2))$
$f(t) * h(t) \ = u_2(t) - 2u_2(t-1) + u_2(t-2) - u_2(t-3) + 2u_2(t-4) - u_2(t-5)$

la grafica de $f(t) * h(t) es$

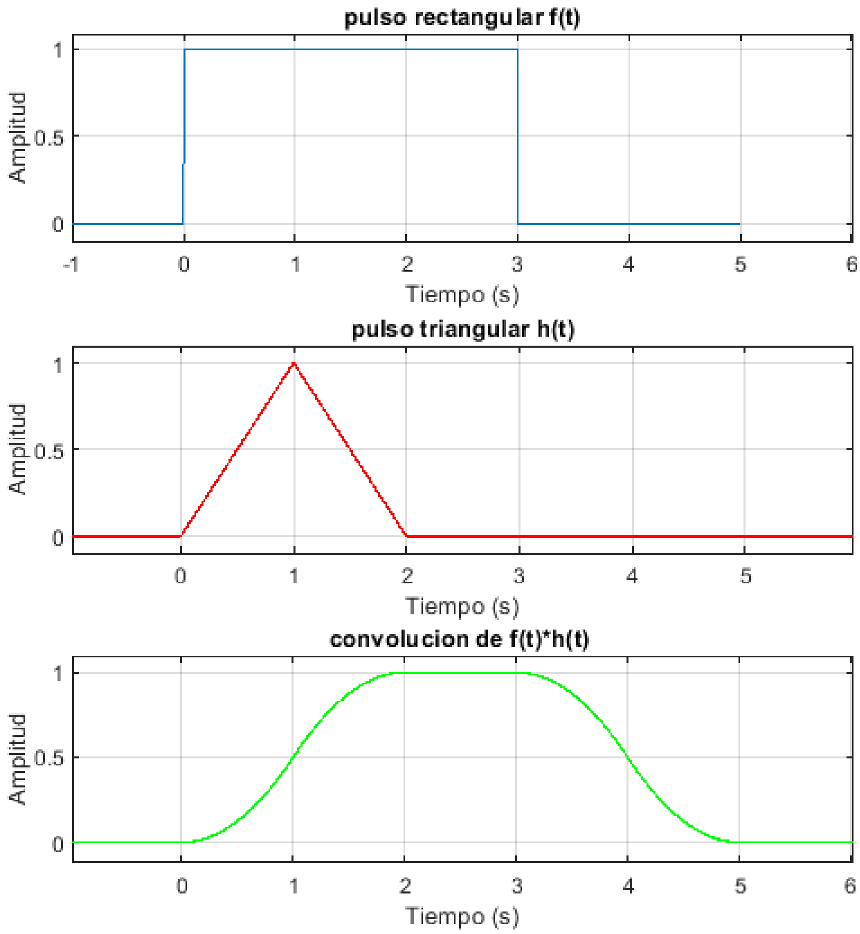

Figure 10: convolucion de $f(t) * h(t)$

la grafica de $g(t) * h(t)$

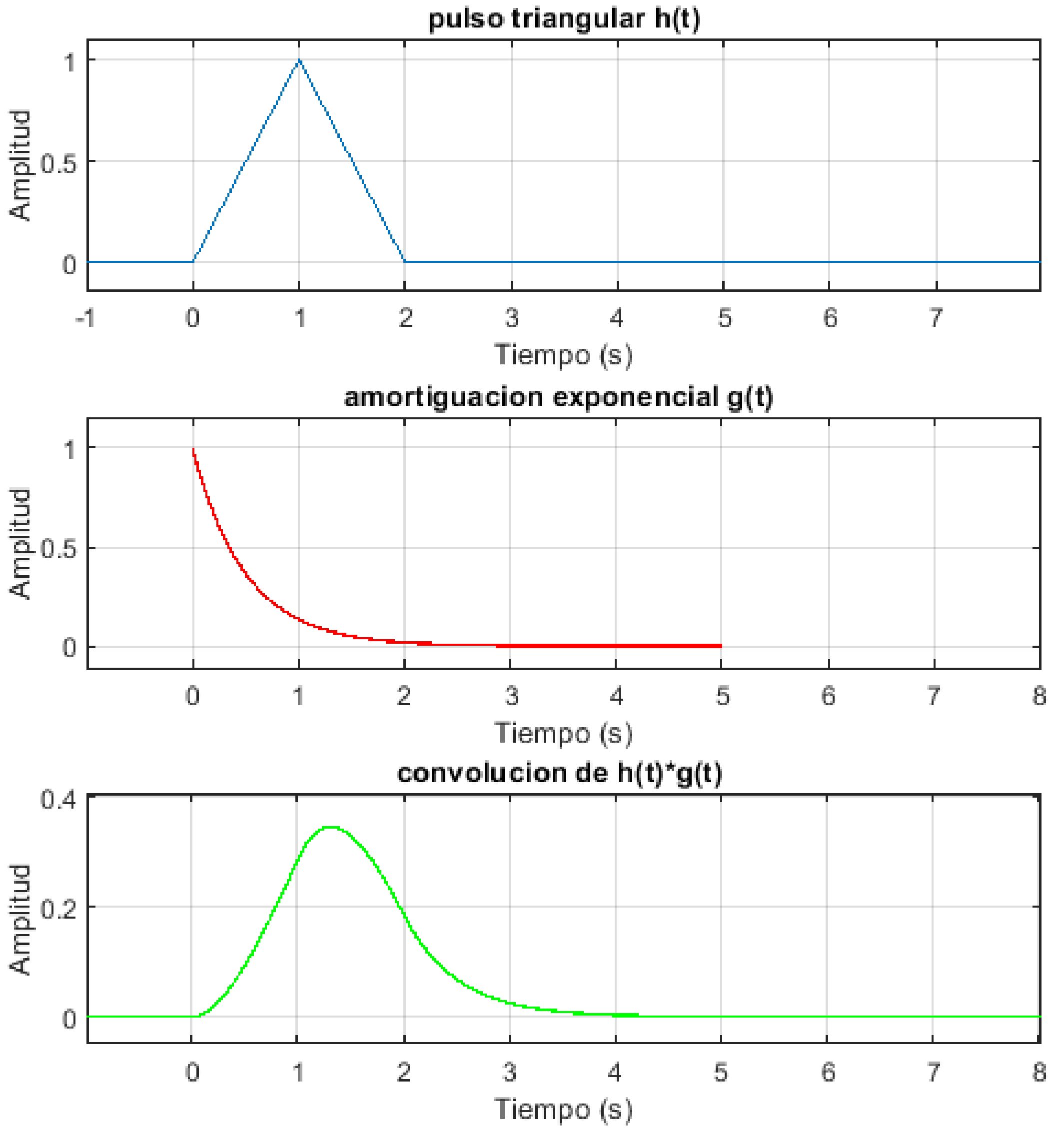

Figure 11: convolucion de $f(t) * h(t)$

Ahora usando **matlab** y el comando *conv* hallaremos las convoluciones de $f(t) * f(t)$, $f(t) * g(t)$, $g(t) * g(t)$, $g(t) * h(t)$, $h(t) * h(t)$

$f(t) * f(t)$

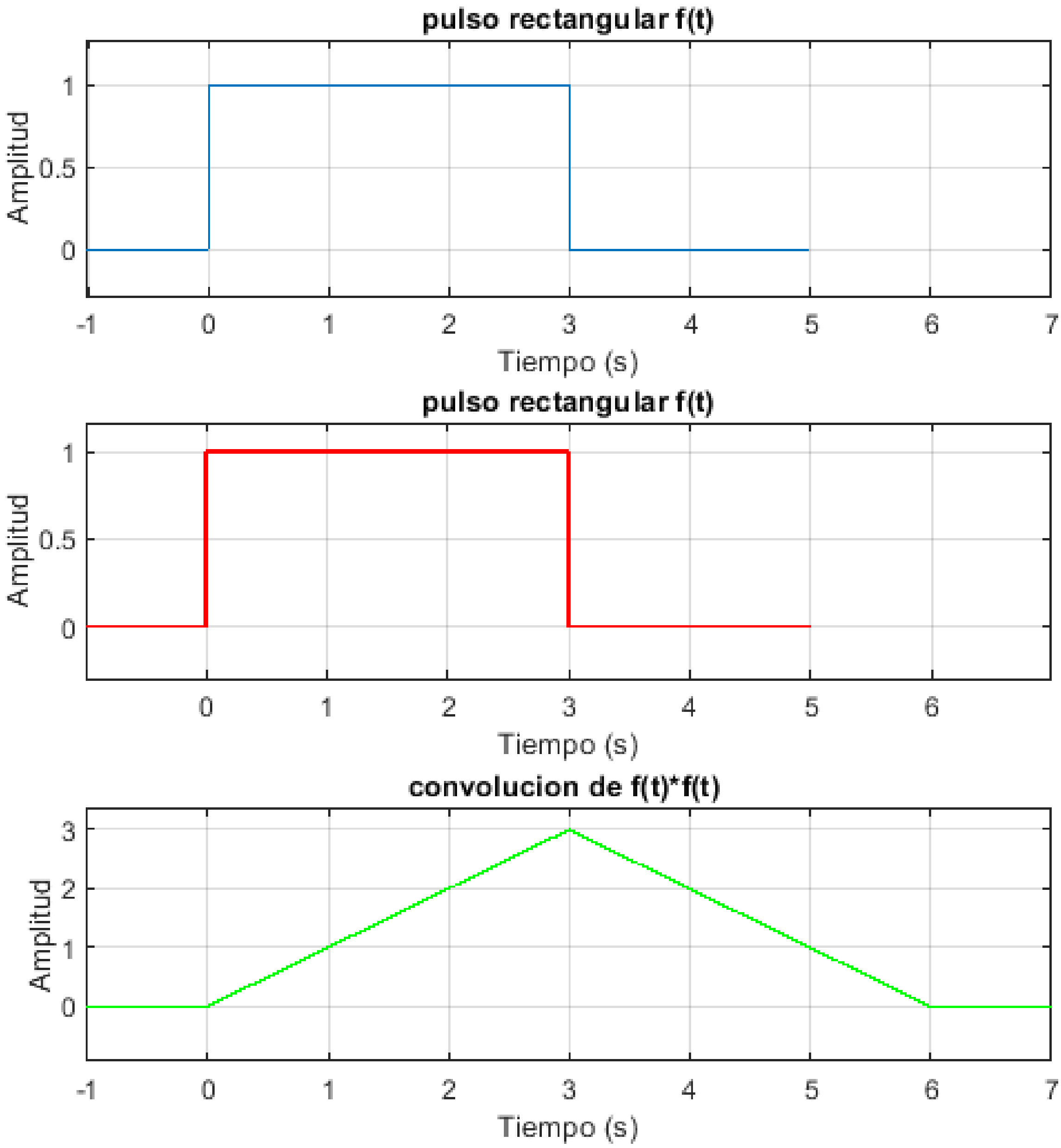

Figure 12: convolucion de $h(t) * h(t)$

$f(t) * g(t)$

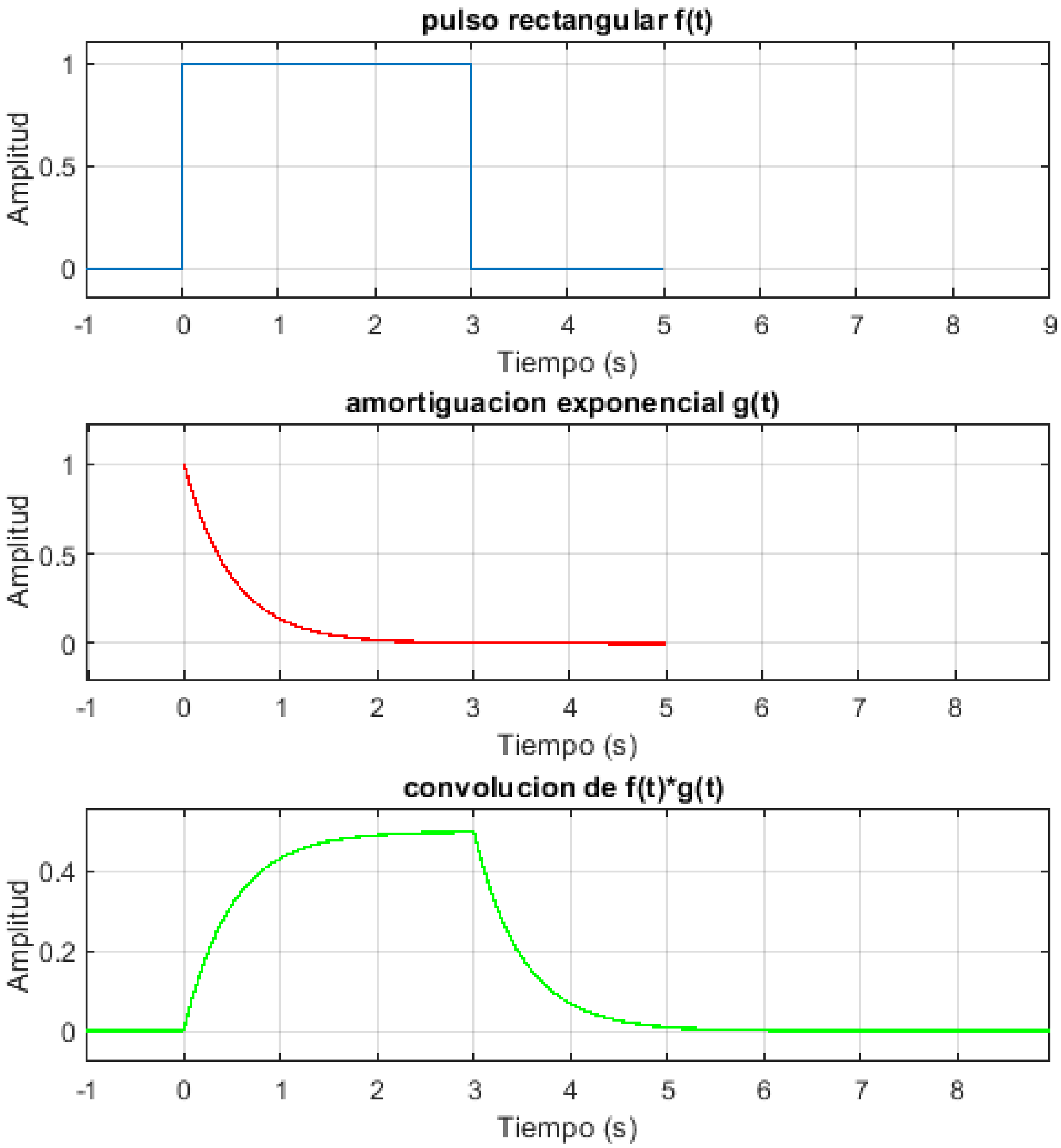

Figure 13: convolucion de $f(t) * h(t)$

$g(t) * g(t)$

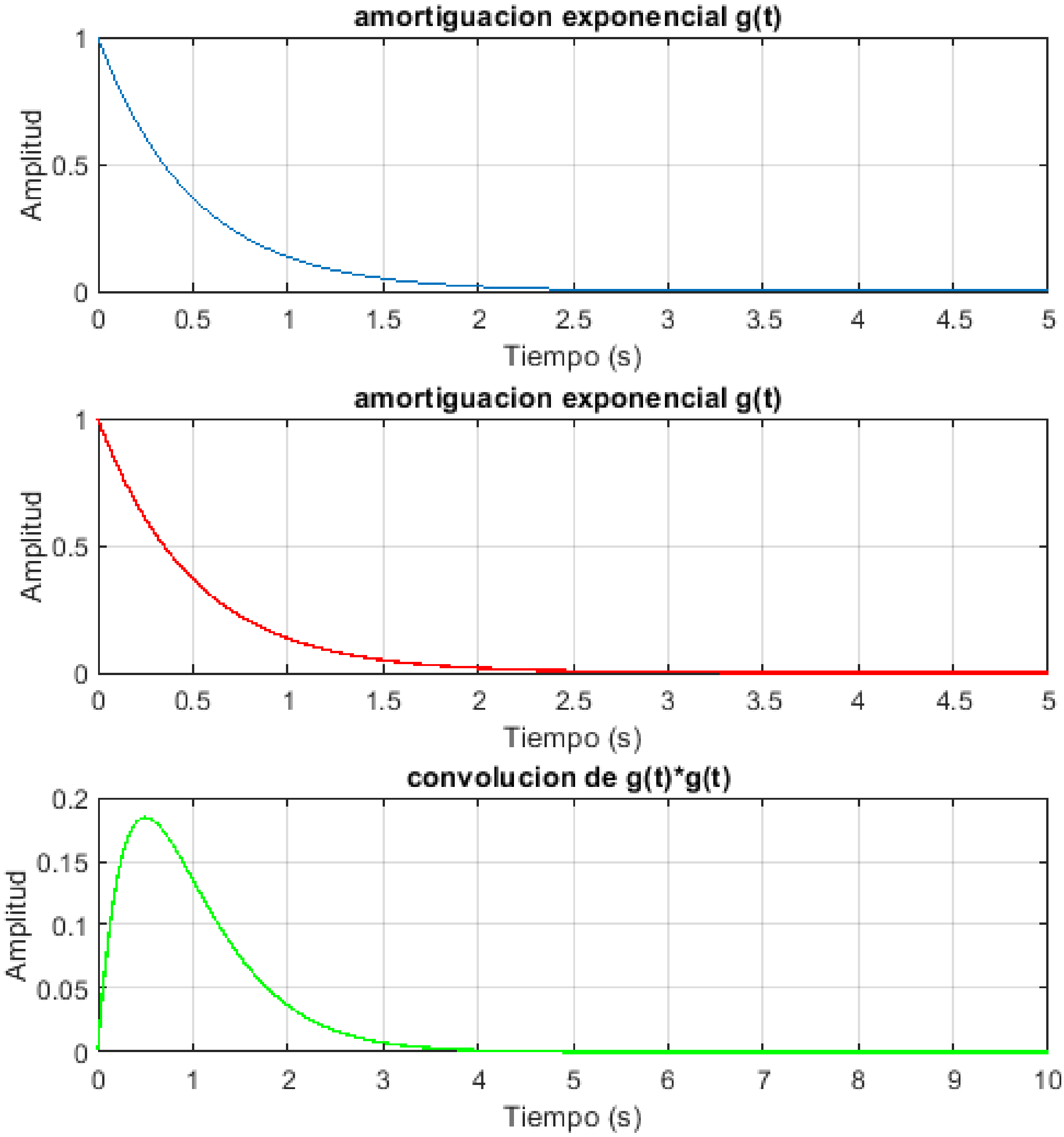

Figure 14: convolucion de $g(t) * g(t)$

$g(t) * h(t) = h(t) * g(t)$

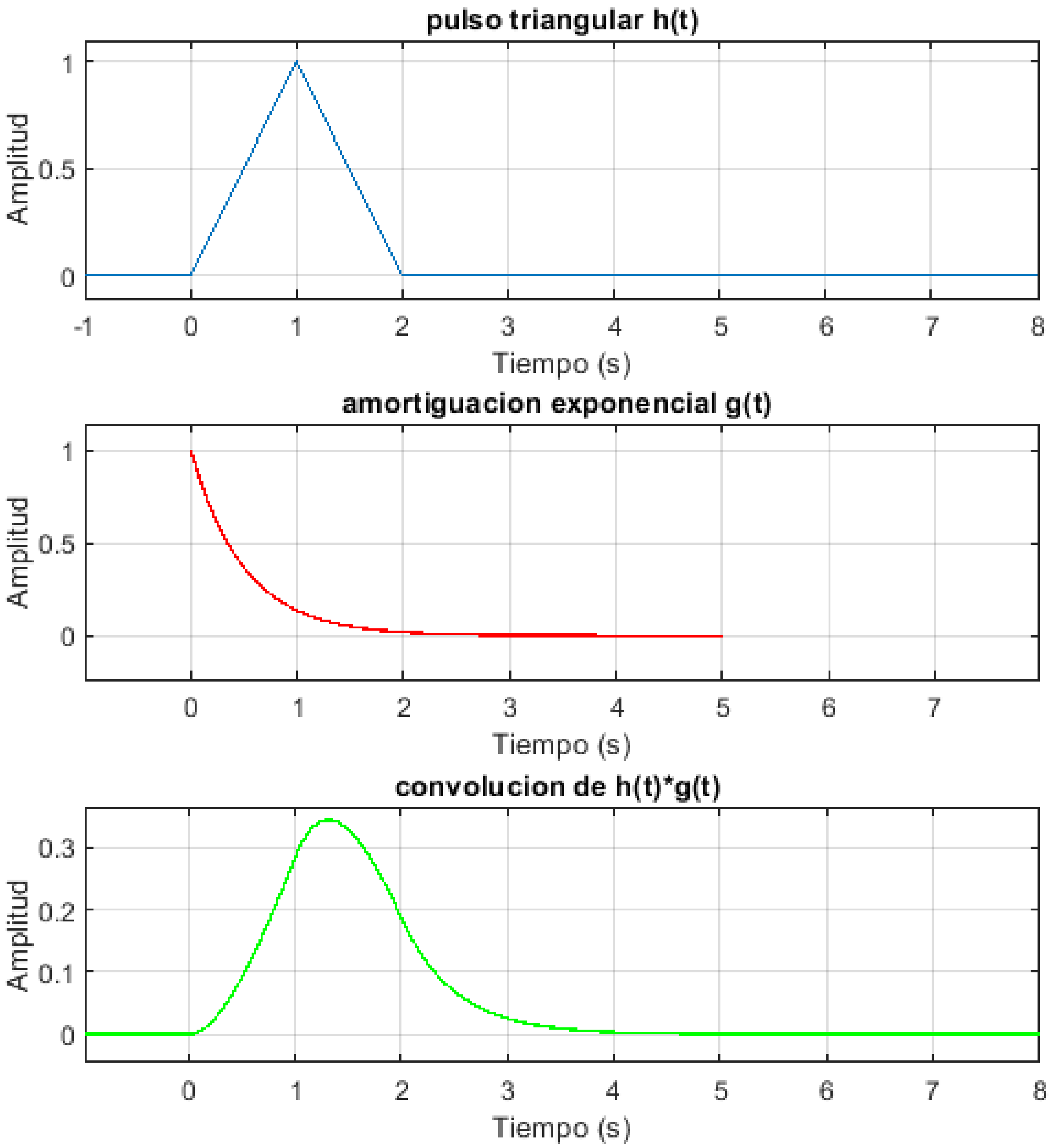

Figure 15: convolucion de $g(t) * g(t)$

$h(t) * h(t) = h(t) * h(t)$

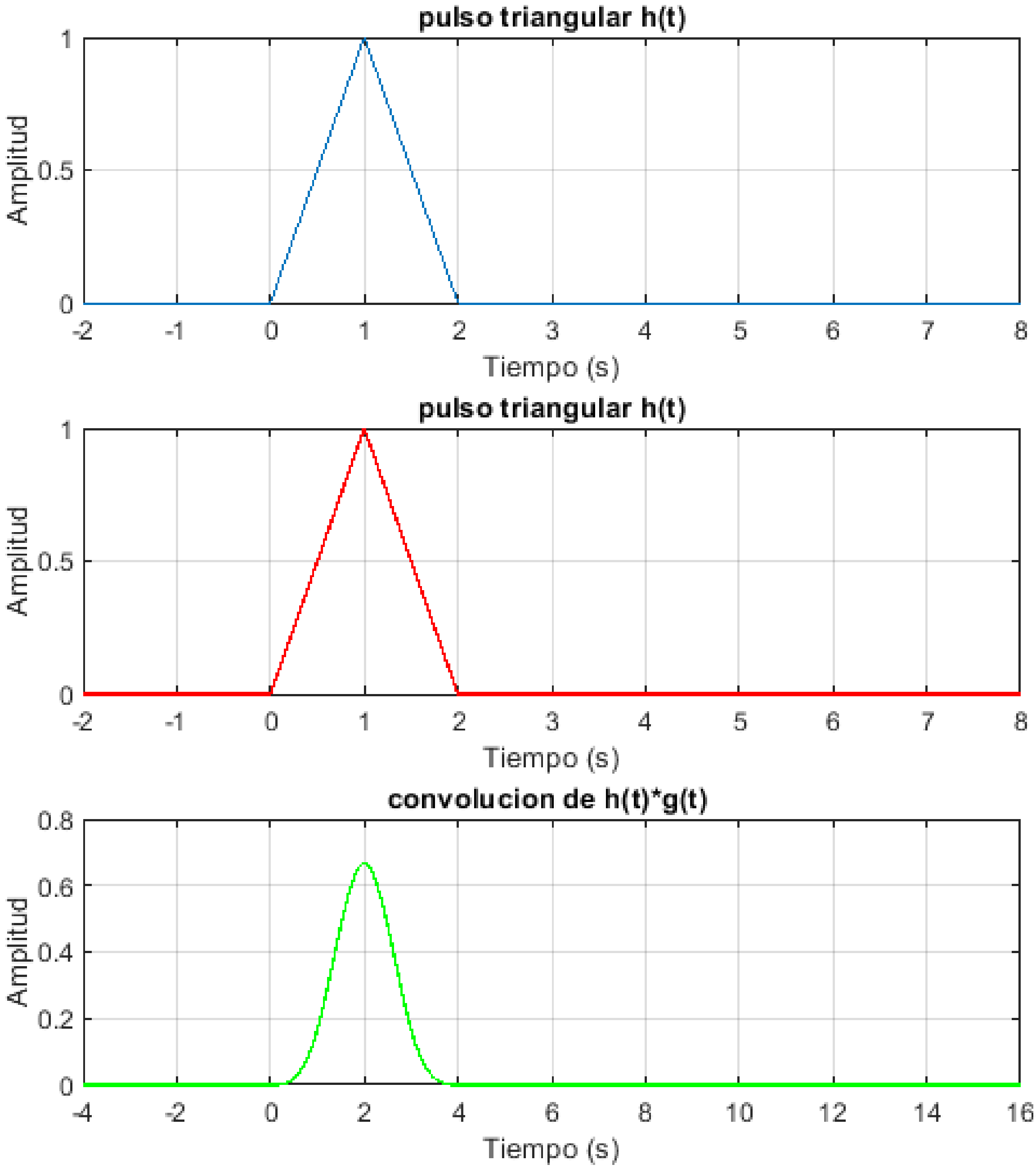

Figure 16: convolucion de $h(t) * g(t)$