IEE 2103 Señales y Sistemas

Clase 2A: Sistemas lineales y convolución

2.1.1 Linealidad

Homogeneidad

$$L\{\alpha f(x)\} = \alpha L\{f(x)\}$$

Superposición

$$L\{f(x) + g(x)\} = L\{f(x)\} + L\{g(x)\}$$

2.1.2 Invariancia

Si $L\{f(x)\} = g(x)$

entonces $L\{f(x-\tau)\} = g(x-\tau)$

Ejemplos

Diga si los sistemas siguientes son lineales y/o invariantes en x

$$L\{f(x)\} = f'(x)$$

$$L\{f(x)\} = |f(x)|$$

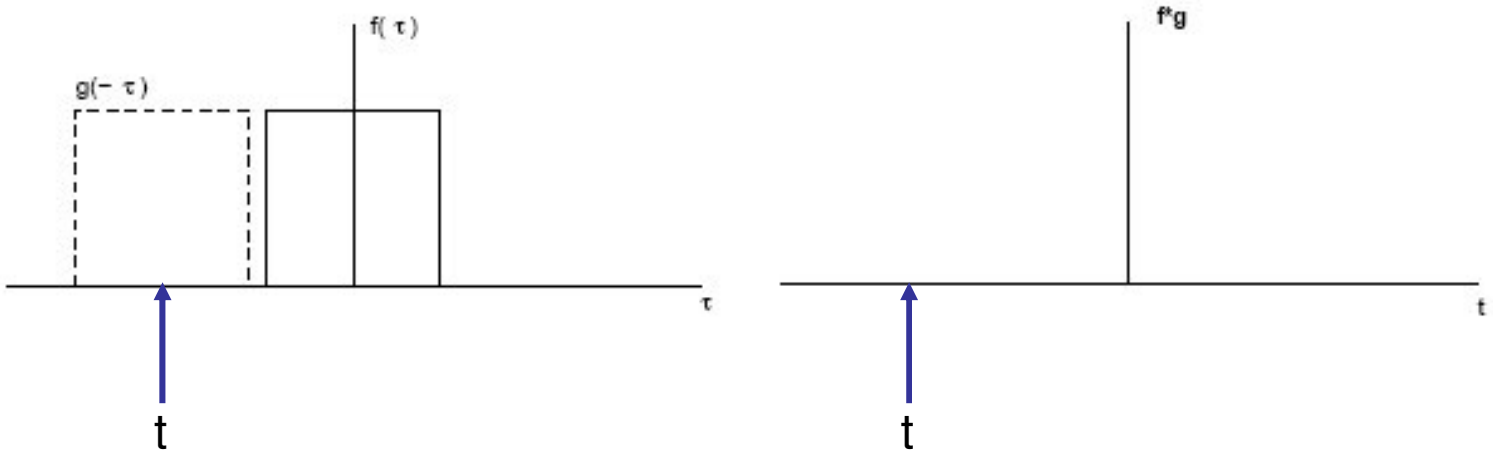
$$L\{f(x)\} = f(x) + h(x)$$

2.2 Convolución

$$f(x) * g(x) = \int_{-\infty}^{\infty} f(\xi) g(x - \xi)\, d\xi$$

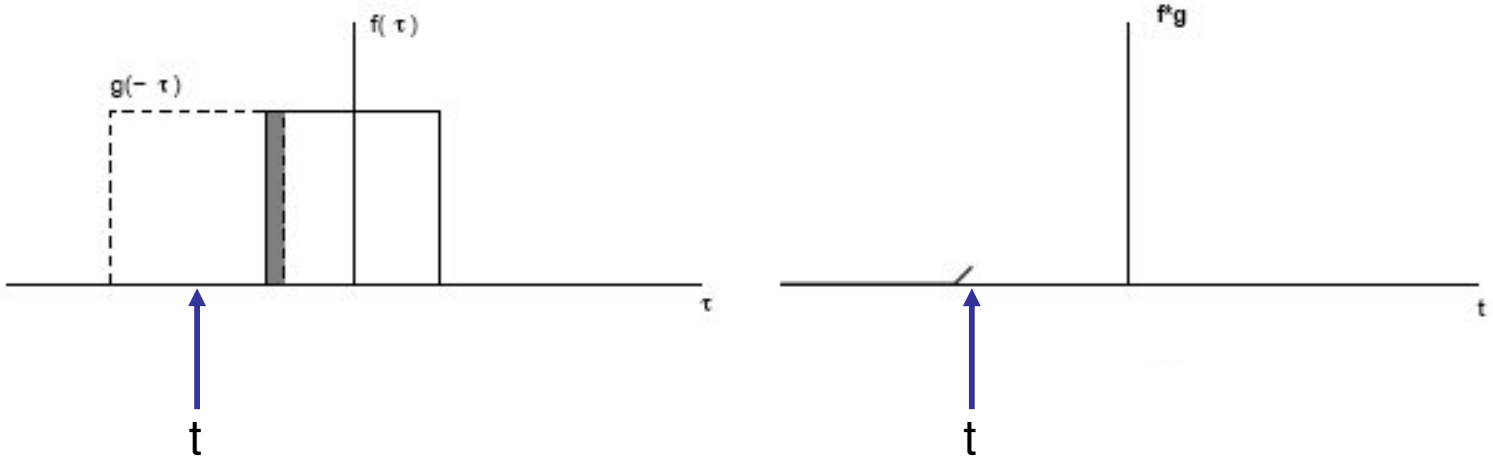
2.2 Convolución

$$\sqcap(t) * \sqcap(t) = \int_{-\infty}^{\infty} \sqcap(\tau)\, \sqcap\,(t-\tau)\, d\tau$$



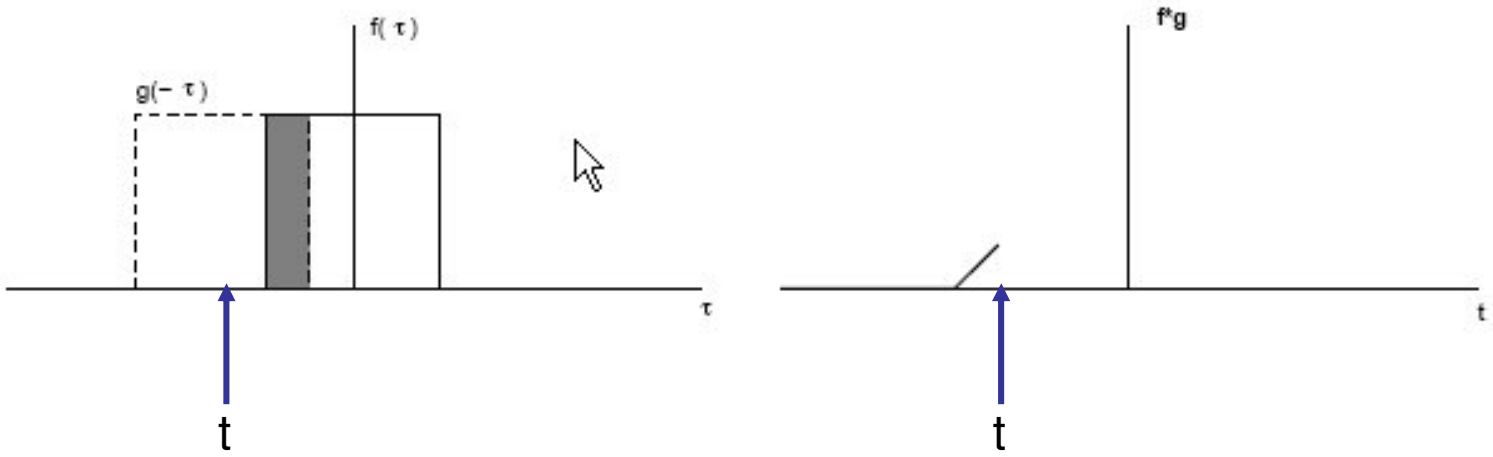
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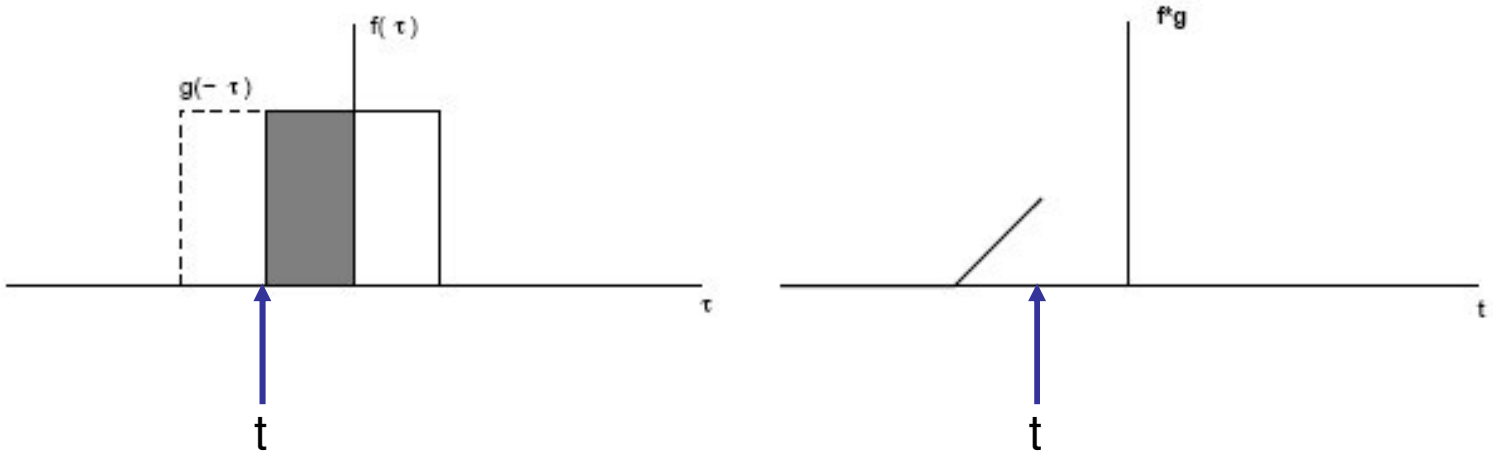
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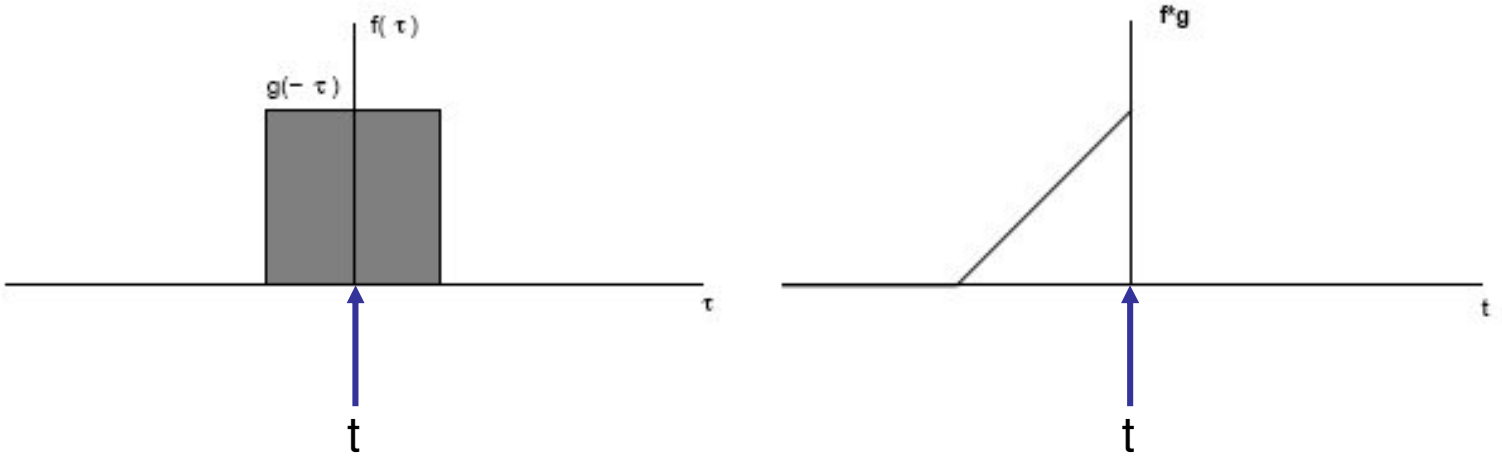
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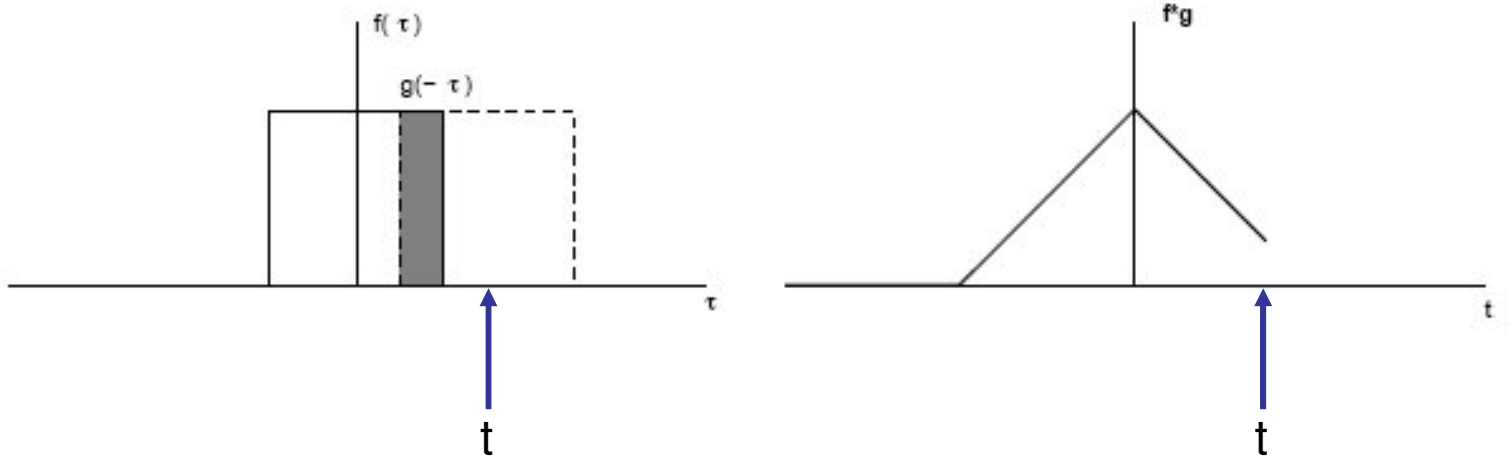
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Ejemplos

$$\delta(x) * \sqcap(x)$$

$$\uparrow\uparrow(x) * \sqcap(x)$$

$$\uparrow\uparrow(x) * \sqcap(x/2)$$

$$\sqcup\!\sqcup(x) * \sqcap(x)$$

$$\sqcup\!\sqcup(x) * \uparrow\uparrow(2x)$$