

Disciplina : Análise de Sistemas Lineares	Data : __/__/__
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Aluno(a):	Trabalho: N1(3.0)
	Nota: ____

Leia atentamente as questões a seguir e faça o que se pede.

## Sinais e Classificação de Sinais

1. Um sinal de tempo contínuo  $x(t)$  é mostrado na Figura 1. Esboce e rotule cada um dos seguintes sinais **1.1**, **1.2**, **1.3** e **1.4**.

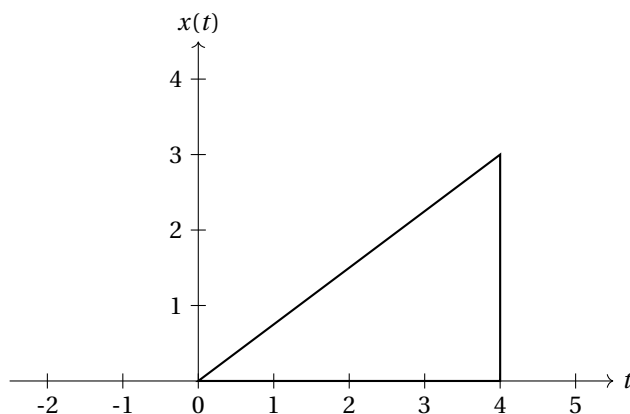
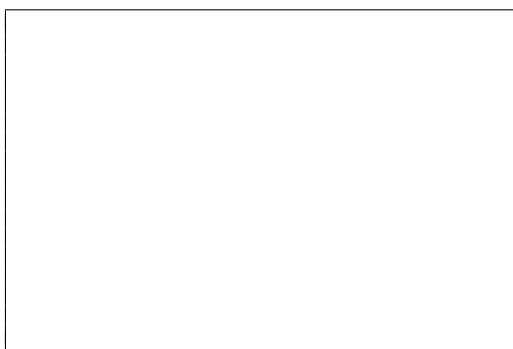
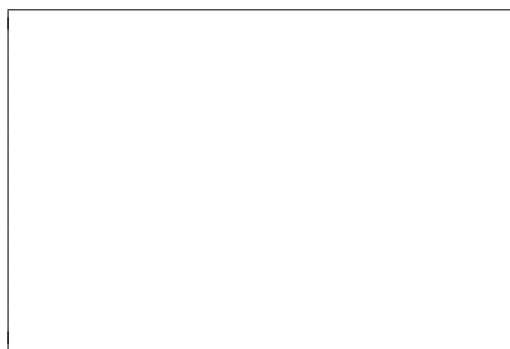


Figura 1: Sinal  $x(t)$


**1.1**  $x(t-2)$



**1.3**  $x(2/t)$



**1.2**  $x(2t)$



**1.4**  $x(-t)$



2. Um sinal de tempo discreto  $x[n]$  é mostrado na Figura 2. Esboce e rotule cada um dos seguintes sinais **2.1**, **2.2**, **2.3** e **2.4**.

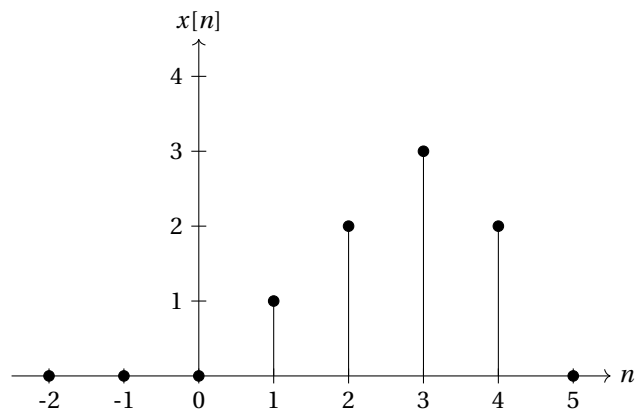
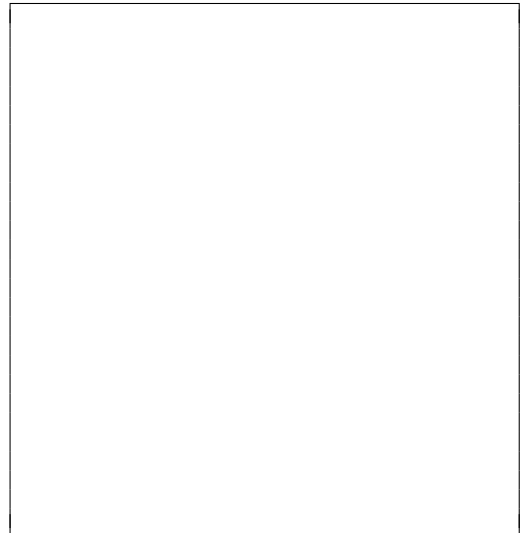


Figura 2: Sinal  $x[n]$

**2.1**  $x[n-2]$



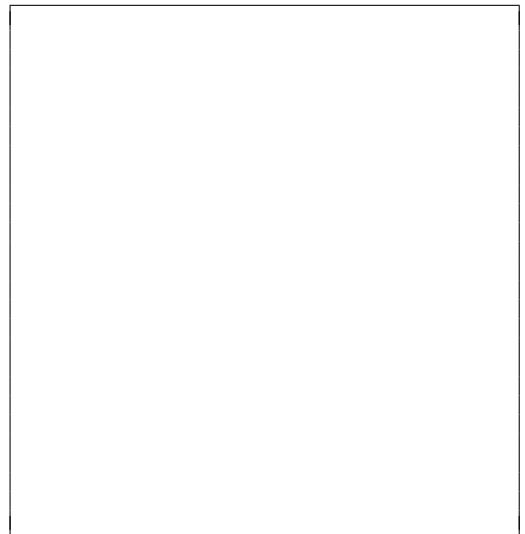
**2.3**  $x[-n]$



**2.2**  $x[2n]$



**2.4**  $x[-n+2t]$

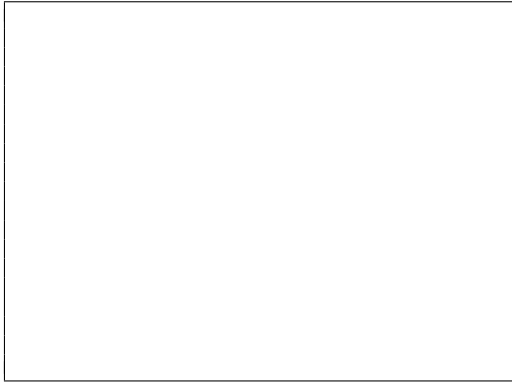


3. Seja o sinal  $x(t)$  contínuo no tempo definido por

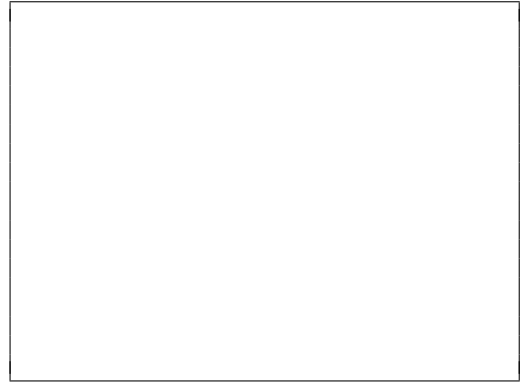
$$x(t) = \begin{cases} 1 - |t| & \text{se } -1 \leq t \leq 1 \\ 0 & \text{caso contrário} \end{cases}$$

Desenhe o gráfico (3.1) do sinal e obtenha a resultante em tempo discreto conforme a amostragem nos itens 3.2, 3.3 e 3.4.

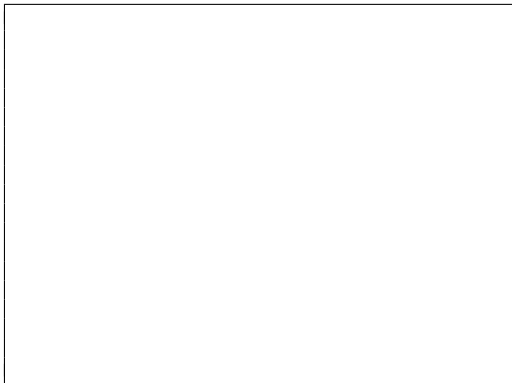
3.1 Forma gráfica do sinal



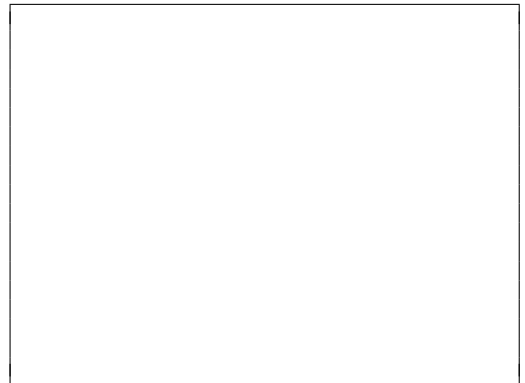
3.3 0,5 s



3.2 0,25 s



3.4 1 s



4. Sejam os sinais  $x_1[n]$  e  $x_2[n]$  exibidos em Figura 3 e Figura 4 resolva as equações dos itens 4.1, 4.2 e 4.3 e desenhe os gráficos.

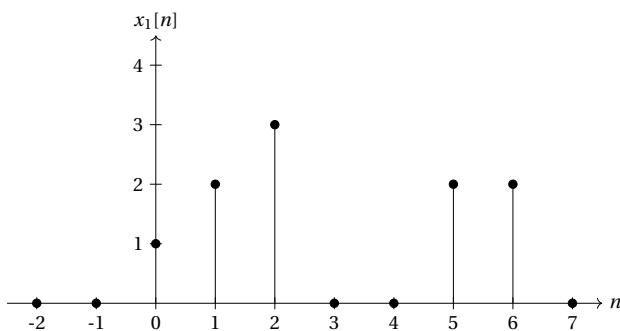


Figura 3:  $x_1[n]$

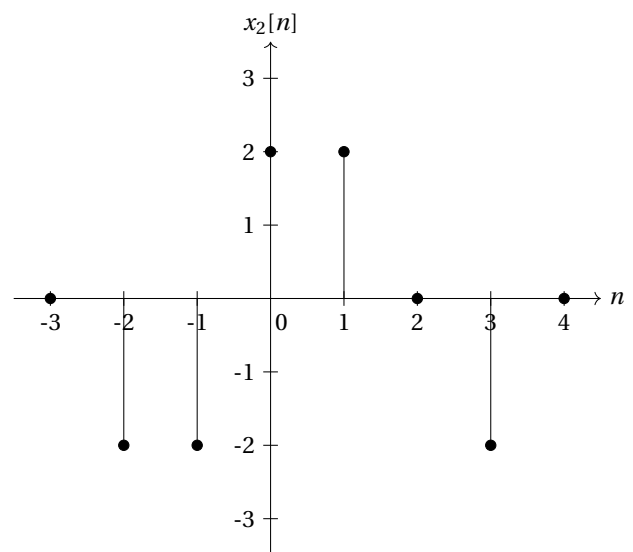


Figura 4:  $x_2[n]$

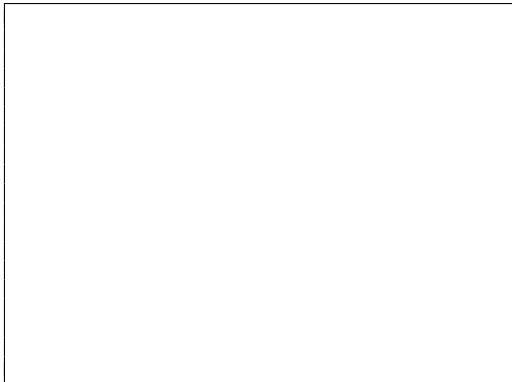
**4.1**  $y_1[n] = x_1[n] + x_2[n]$



**4.3**  $y_3[n] = x_1[n] \cdot x_2[n]$



**4.2**  $y_2[n] = 2 \cdot x_1[n]$



**5.** Esboce e rotule os componentes pares e ímpares dos sinais exibidos nas figuras 5, 6, 7 e 8.

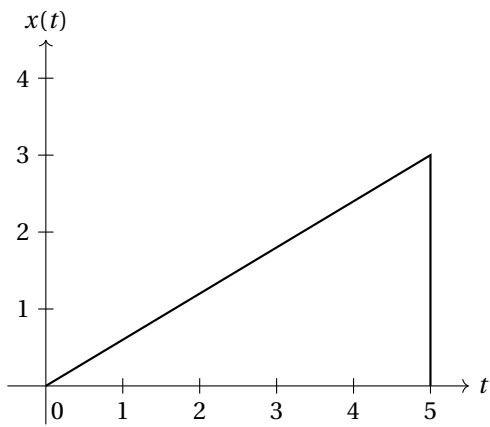


Figura 5:  $x(t)$

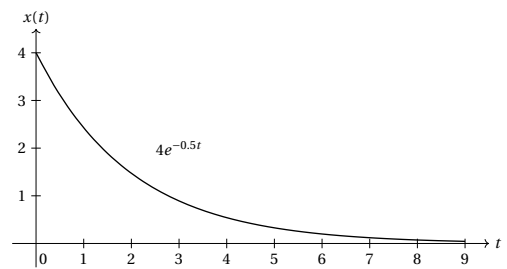


Figura 6:  $x(t)$

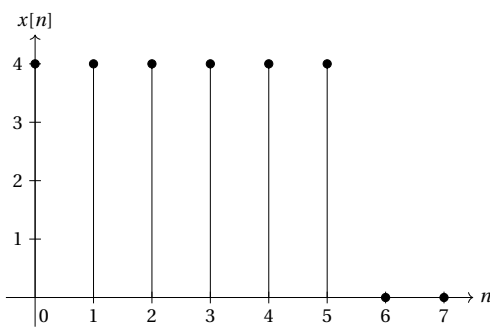


Figura 7:  $x[n]$

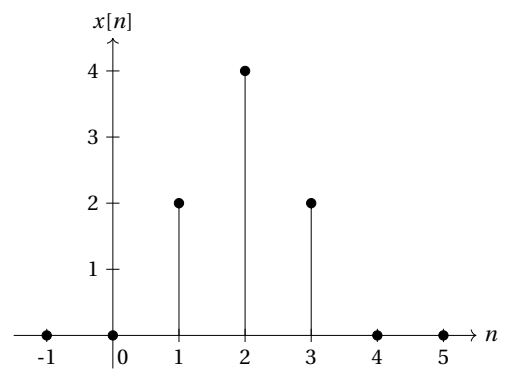


Figura 8:  $x[n]$

**5.1** Figura 5



**5.3** Figura 7



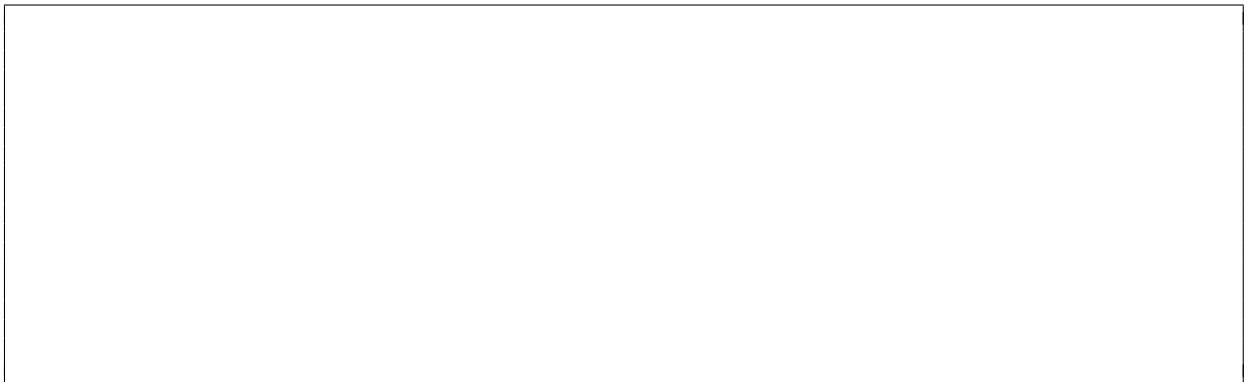
**5.2** Figura 6



**5.4** Figura 8



- 6.** Encontre as componentes pares e ímpares do sinal  $x(t) = e^{jt}$ .



- 7.** Demonstre que o produto de dois sinais pares ou de dois sinais ímpares é um sinal par e que o produto de um sinal par e um sinal ímpar é um sinal ímpar.



- 8.** Demonstre que um sinal exponencial complexo  $x(t) = e^{j\omega_0 t}$  é um sinal periódico e que seu período fundamental é  $2\pi/\omega_0$ .

9. Demonstre que um sinal senoidal  $x(t) = \cos(\omega_0 t + \theta)$  é um sinal periódico e que seu período fundamental é  $2\pi/\omega_0$ .

10. Determine se os seguintes sinais são sinais de energia, sinais de potência ou nenhum dos dois.

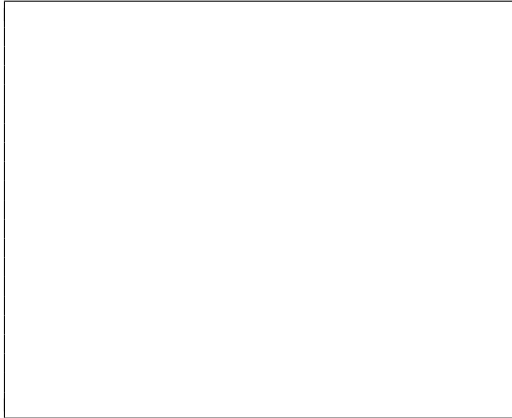
10.1  $x(t) = e^{-\alpha t} u(t)$  onde  $\alpha > 0$

10.3  $x(t) = t \cdot u(t)$

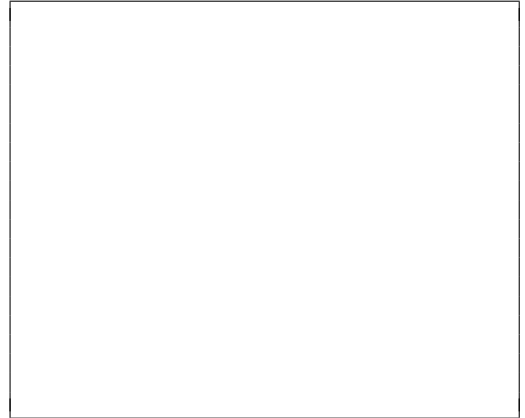
10.2  $x(t) = A \cdot \cos(\omega_0 t + \theta)$

10.4  $x[n] = (-0.5)^n \cdot u[n]$

**10.5**  $x[n] = u[n]$



**10.6**  $x[n] = 2e^{j3n}$

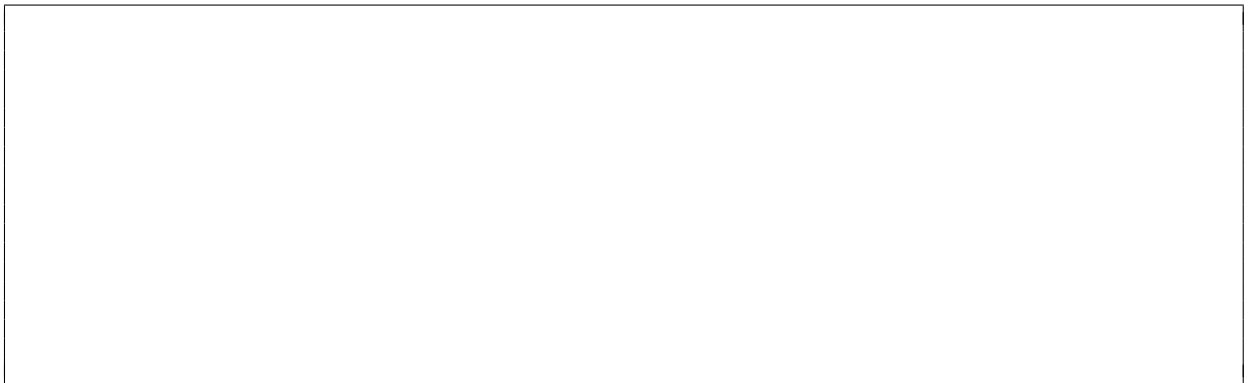


## Decomposição de Sinais

**11.** Considere o sinal

$$u(-t) = \begin{cases} 0 & t \geq 0 \\ 1 & t \leq 0 \end{cases}$$

E obtenha  $u(\tau)$  onde  $\tau = -t$  e plote o gráfico.



**12.** Considere o sinal  $x(t)$  em tempo contínuo exibido Figura 9. Esboce e rotule cada forma de sinal.

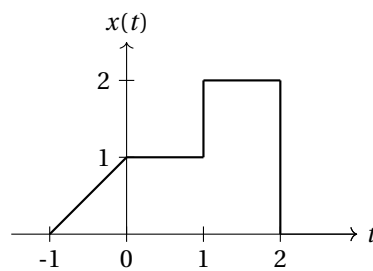
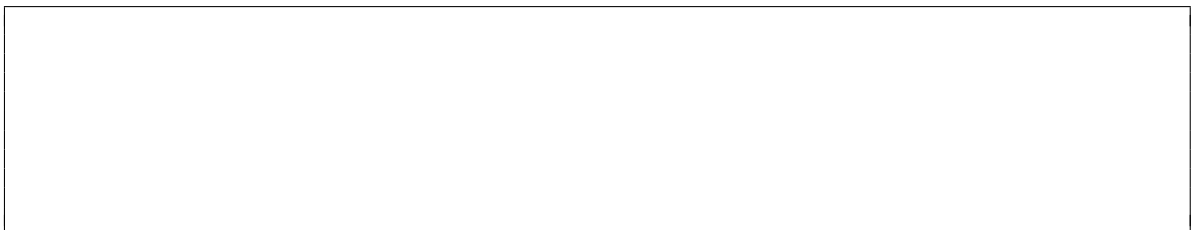


Figura 9: Sinal  $x(t)$

**12.1**  $x(t)u(1-t)$



**12.2**  $x(t)[u(t) - u(t - 1)]$

**12.3**  $x(t)\delta\left(t - \frac{3}{2}\right)$

**13.** Considere o sinal discreto  $x[n]$  exibido Figura 10. Esboque e rotule cada forma de signal.

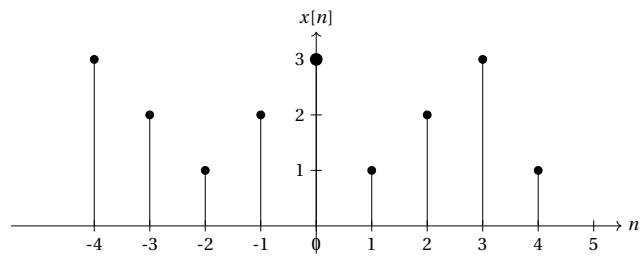


Figura 10: Sinal  $x[n]$

**13.1**  $x[n]u[1 - n]$

**13.2**  $x[n]\{u[n + 2] - u[n]\}$

**13.3**  $x[n]\delta[n - 1]$



**14.** Demonstre que:

**14.1**  $t\delta(t) = 0$

**14.2**  $\sin(t\delta(t)) = 0$

**14.3**  $\cos(t\delta(t-\pi)) = -\delta(t-\pi)$

**15.** Resolva as integrais a seguir:

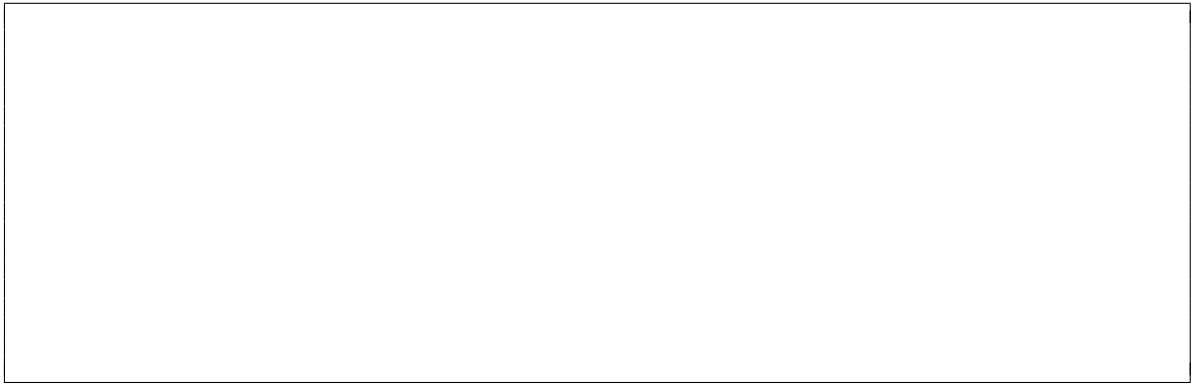
**15.1**  $\int_{-1}^1 (3t^2 + 1)\delta(t) dt$

**15.2**  $\int_1^2 (3t^2 + 1)\delta(t) dt$

**15.3**  $\int_{-\infty}^{\infty} (t^2 + \cos(\pi t))\delta(t-1) dt$

**15.4**  $\int_{-\infty}^{\infty} e^{-t}\delta(2t-2) dt$

**15.5**  $\int_{-\infty}^{\infty} e^{-t} + \delta'(t) dt$



**Sistemas**