Cálculo C - Lista 18

Transformada de Laplace (IV):

Função degrau unitária

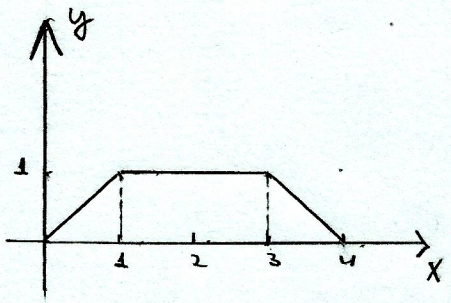
Faça um esboço do gráfico da função dada para $t \geq 0$

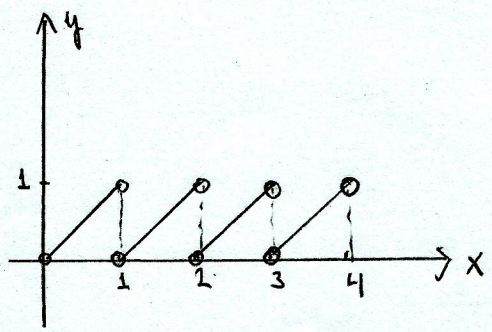
1. $tu(t-1)$
2. $u(t-1) - 3u(t-4) - 4u(t-5)$
3. $(t^2-4)u(t-4)$
4. $\sin(t-\pi)u(t-\pi)$
5. $t(u(t) - u(t-1)) + (u(t-1) - u(t-3)) + + (u(t-3) - u(t-4))(4-t)$
6. $u(t-1) - 2u(t-2) + 2u(t-3) - 2u(t-4) + \ldots$

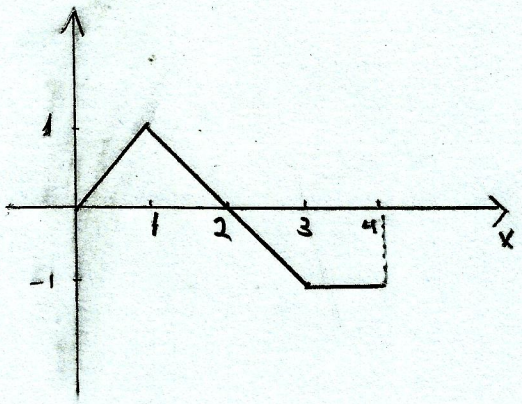
Represente as funções em termos da função degrau unitário e encontre a transformada de Laplace

7.
$$f(t) = \begin{cases} 3, & 0 < t < 2 \\ t+1, & 2 < t \end{cases}$$

8.
$$f(t) = \begin{cases} \sin 3t, & 0 < t < \pi \\ 0, & \pi < t \end{cases}$$

9.


10.


11.


Encontre a transformada de Laplace inversa das funções

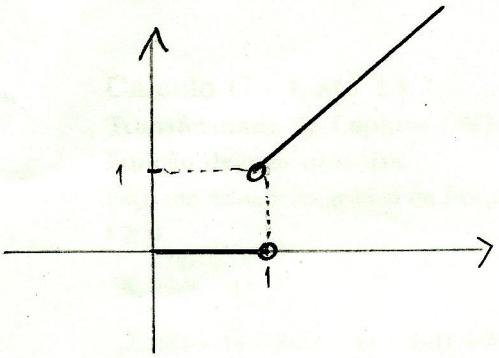
12. $\frac{e^{-4s} - e^{-s}}{s^3}$
13. $\frac{e^{-3s}}{s^2-9}$
14. $\frac{e^{-s}}{(s-1)(s-2)}$
15. $\frac{e^{-s}}{(s+1)^3}$
16. $\frac{(s-2)e^{-s}}{s^2-4s+3}$

Encontre a transformada de Laplace das funções

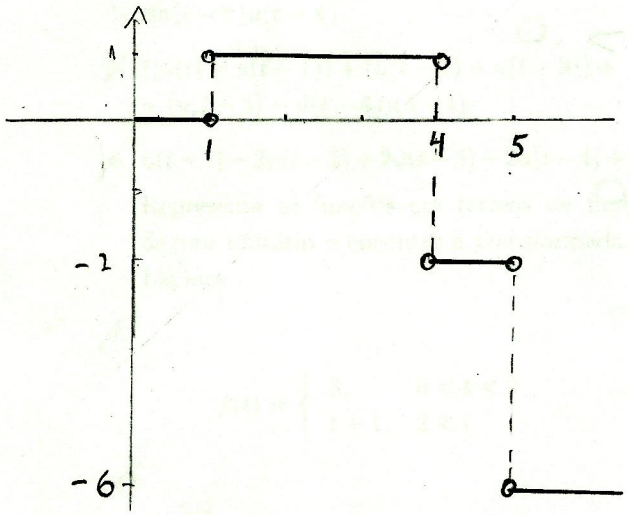
17. $t\,u(t-2)$
18. $\cos t\,u(t-\pi)$
19. $e^t\,u(t-3)$
20. $\sin t\,u(t-\pi/2)$

Lista 18 - Respostas

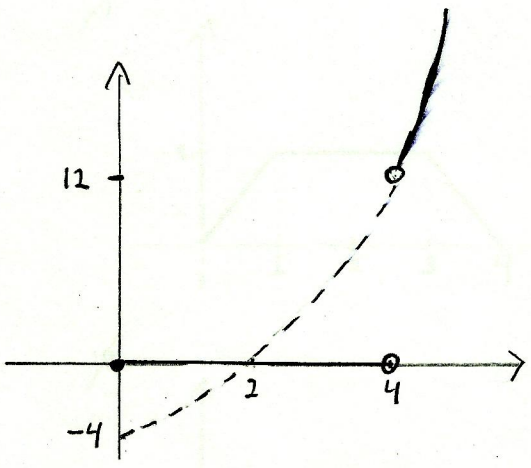
1.



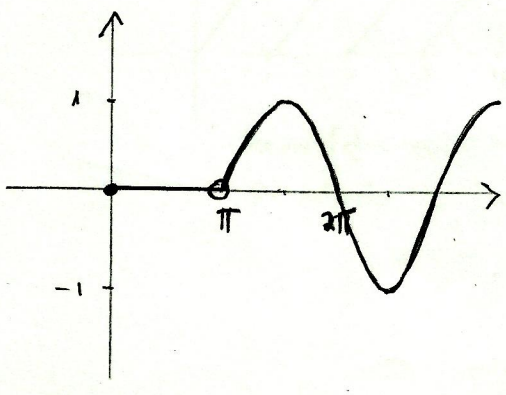
2.



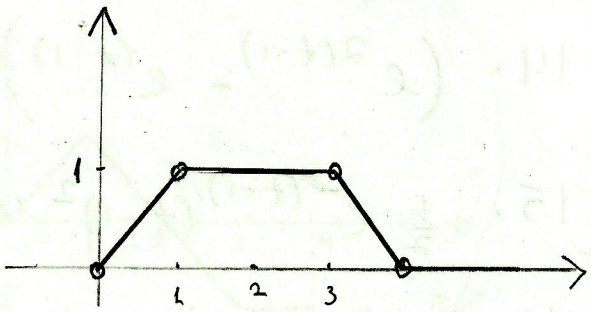
3.



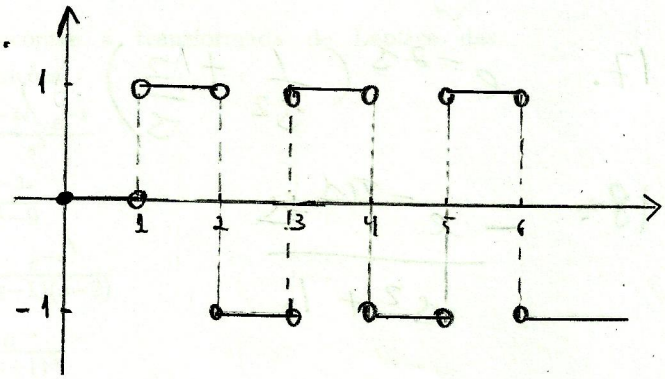
4.



5.



6.



7. $\frac{3}{s} + \frac{e^{-2s}}{s^2}$

8. $\frac{3}{s^2+9}\left(1+e^{-\pi s}\right)$

9. $\frac{1}{s^2}\left(1-e^{-s}-e^{-3s}+e^{-4s}\right)$

10. $\frac{1}{s^2} - \frac{1}{s}\left(e^{-s}+e^{-2s}+e^{-3s}+\dots\right)$

$= \frac{1}{s^2} - \frac{e^{-s}}{s(1-e^{-s})}$

11. $\frac{1}{s^2} - 2\frac{e^{-s}}{s^2} + \frac{e^{-3s}}{s^2} + \frac{e^{-4s}}{s}$

12. $\frac{1}{2}(t-4)^2 u(t-4) - \frac{1}{2}(t-1)^2 u(t-1)$

13. $\frac{1}{3}\sinh 3(t-3)\,u(t-3)$

14. $\left(e^{2(t-1)} - e^{(t-1)}\right)u(t-1)$

15. $\frac{1}{2}e^{-(t-1)}(t-1)^2 u(t-1)$

16. $\frac{1}{2}\left[e^{3(t-1)} + e^{(t-1)}\right]u(t-1)$

17. $e^{-2s}\left(\frac{1}{s^2} + \frac{2}{s}\right)$, $s > 0$

18. $\frac{-e^{-\pi s}s}{s^2+1}$, $s > 0$

19. $\frac{e^{3-3s}}{s-1}$, $s > 1$

20. $\frac{e^{-\frac{\pi}{2}s}s}{s^2+1}$, $s > 0$