Cálculo C - Lista 15
Transformada de Laplace (I)

Propriedades:

$\mathcal{L}(f') = s\mathcal{L}(f) - f(0)$ (1)

$\mathcal{L}(f^{(n)}) = s^n\mathcal{L}(f) - s^{n-1}f(0) - s^{n-2}f'(0) -$
$\qquad\qquad - ... - f^{(n-1)}(0)$ (2)

$\mathcal{L}\left(\int_0^t f(u)du\right) = \frac{1}{s}\mathcal{L}(f)$ (3)

Encontre a transformada de Laplace das seguintes funções

1. $t + 4$

2. $a + bt + ct^2$

3.

4.

5.
$$f(t) = \begin{cases} 0, & 0 \le t < 1 \\ t, & 1 \le t < 2 \\ 1, & 2 \le t \end{cases}$$

6.
$$f(t) = \begin{cases} 0, & 0 \le t \le 5 \\ e^{-t}, & 5 < t \end{cases}$$

7. $(t^2 + \frac{1}{2})^2$

8. $\sin \pi t$

9. $\cos(\omega t + \theta)$

10. $\cos^2 t$

11. $\cos^2 \omega t$

12. $\sinh^2 2t$

Use os teoremas da derivada (1) e (2) e obtenha as transformadas a seguir

13. $\mathcal{L}(t\cos\omega t) = \frac{s^2 - \omega^2}{(s^2 + \omega^2)^2}$

14. $\mathcal{L}(t\sin\omega t) = \frac{2\omega s}{(s^2 + \omega^2)^2}$

15. $\mathcal{L}(t\cosh at) = \frac{s^2 + a^2}{(s^2 - a^2)^2}$

16. $\mathcal{L}(t\sinh at) = \frac{2as}{(s^2 - a^2)^2}$

Use o teorema da integral (3) para calcular $f(t)$ sendo dado $\mathcal{L}(f)$

17. $\frac{1}{s^2 + s}$

18. $\frac{10}{s(s^2 + 9)}$

19. $\frac{1}{s^2(s+1)}$

20. $\frac{1}{s^2}\left(\frac{s-1}{s+1}\right)$

21. $\frac{54}{s^3(s-3)}$

22. $\frac{1}{s^2}\left(\frac{s+1}{s^2+1}\right)$