Universidade Tecnológica Federal do Paraná (UTFPR)
Coordenação de Engenharia Eletrônica (COELE)

Disciplina: CD3X1 – Cálculo Diferencial e Integral 1
Professor: Paulo Dênis Garcez da Luz
Contato: garcez@utfpr.edu.br , **Site**: www.cd3x1.hturbo.com

---

Fórmulas de Transformada de Laplace:

Transformada de Laplace:

$$F(s) = \int_0^{\infty} e^{-st} \cdot f(t)dt$$

Transformada Inversa:

$$Ai = \left[\left(S - Ri \right) \cdot F(s) \right]_{S=Ri}$$

$$Kn = \frac{1}{(n-1)!} \left[\frac{d^{n-1}}{dS^{n-1}} \left(S - Rn \right)^r \cdot F(s) \right]_{S=Rn}$$

	$f(t)$	$F(s)$
1	Impulso unitário δ*(t)*	1
2	Degrau unitário 1*(t)*	$\frac{1}{s}$
3	t	$\frac{1}{s^2}$
4	$\frac{t^{n-1}}{(n-1)!} \quad (n = 1, 2, 3, ...)$	$\frac{1}{s^n}$
5	$t^n \quad (n = 1, 2, 3, ...)$	$\frac{n!}{s^{n+1}}$
6	e^{-at}	$\frac{1}{s+a}$
7	te^{-at}	$\frac{1}{(s+a)^2}$
8	$\frac{1}{(n-1)!} t^{n-1} e^{-at} \quad (n = 1, 2, 3, ...))$	$\frac{1}{(s+a)^n}$
9	$t^n e^{-at} \quad (n = 1, 2, 3, ...)$	$\frac{n!}{(s+a)^{n+1}}$
10	$\operatorname{sen} \omega t$	$\frac{\omega}{s^2 + \omega^2}$
11	$\cos \omega t$	$\frac{s}{s^2 + \omega^2}$
12	$\operatorname{senh} \omega t$	$\frac{\omega}{s^2 - \omega^2}$
13	$\cosh \omega t$	$\frac{s}{s^2 - \omega^2}$
14	$\frac{1}{a}\left(1 - e^{-at}\right)$	$\frac{1}{s(s+a)}$
15	$\frac{1}{b-a}\left(e^{-at} - e^{-bt}\right)$	$\frac{1}{(s+a)(s+b)}$

16	$\frac{1}{b-a}\left(be^{-bt}-ae^{-at}\right)$	$\frac{s}{(s+a)(s+b)}$
17	$\frac{1}{ab}\left[1+\frac{1}{a-b}\left(be^{-at}-ae^{-bt}\right)\right]$	$\frac{1}{s(s+a)(s+b)}$
18	$\frac{1}{a^2}\left(1-e^{-at}-ate^{-at}\right)$	$\frac{1}{s(s+a)^2}$
19	$\frac{1}{a^2}\left(at-1+e^{-at}\right)$	$\frac{1}{s^2(s+a)}$
20	$e^{-at}\operatorname{sen}\omega t$	$\frac{\omega}{(s+a)^2+\omega^2}$
21	$e^{-at}\cos\omega t$	$\frac{s+a}{(s+a)^2+\omega^2}$
22	$\frac{\omega_n}{\sqrt{1-\zeta^2}}e^{-\zeta\omega_n t}\operatorname{sen}\omega_n\sqrt{1-\zeta^2}t$	$\frac{\omega_n^2}{s^2+2\zeta\omega_n s+\omega_n^2}$
23	$-\frac{1}{\sqrt{1-\zeta^2}}e^{-\zeta\omega_n t}\operatorname{sen}\left(\omega_n\sqrt{1-\zeta^2}t-\phi\right)$ $\phi=\tan^{-1}\frac{\sqrt{1-\zeta^2}}{\zeta}$	$\frac{s}{s^2+2\zeta\omega_n s+\omega_n^2}$
24	$1-\frac{1}{\sqrt{1-\zeta^2}}e^{-\zeta\omega_n t}\operatorname{sen}\left(\omega_n\sqrt{1-\zeta^2}t+\phi\right)$ $\phi=\tan^{-1}\frac{\sqrt{1-\zeta^2}}{\zeta}$	$\frac{\omega_n^2}{s\left(s^2+2\zeta\omega_n s+\omega_n^2\right)}$
25	$1-\cos\omega t$	$\frac{\omega^2}{s\left(s^2+\omega^2\right)}$
26	$\omega t-\operatorname{sen}\omega t$	$\frac{\omega^3}{s^2\left(s^2+\omega^2\right)}$
27	$\operatorname{sen}\omega t-\omega t\cos\omega t$	$\frac{2\omega^3}{\left(s^2+\omega^2\right)^2}$
28	$\frac{1}{2\omega}t\operatorname{sen}\omega t$	$\frac{s}{\left(s^2+\omega^2\right)^2}$
29	$t\cos\omega t$	$\frac{s^2-\omega^2}{\left(s^2+\omega^2\right)^2}$
30	$\frac{1}{\omega_2^2-\omega_1^2}\left(\cos\omega_1 t-\cos\omega_2 t\right)\qquad\left(\omega_1^2\neq\omega_2^2\right)$	$\frac{s}{\left(s^2+\omega_1^2\right)\left(s^2+\omega_2^2\right)}$
31	$\frac{1}{2\omega}\left(\operatorname{sen}\omega t+\omega t\cos\omega t\right)$	$\frac{s^2}{\left(s^2+\omega^2\right)^2}$