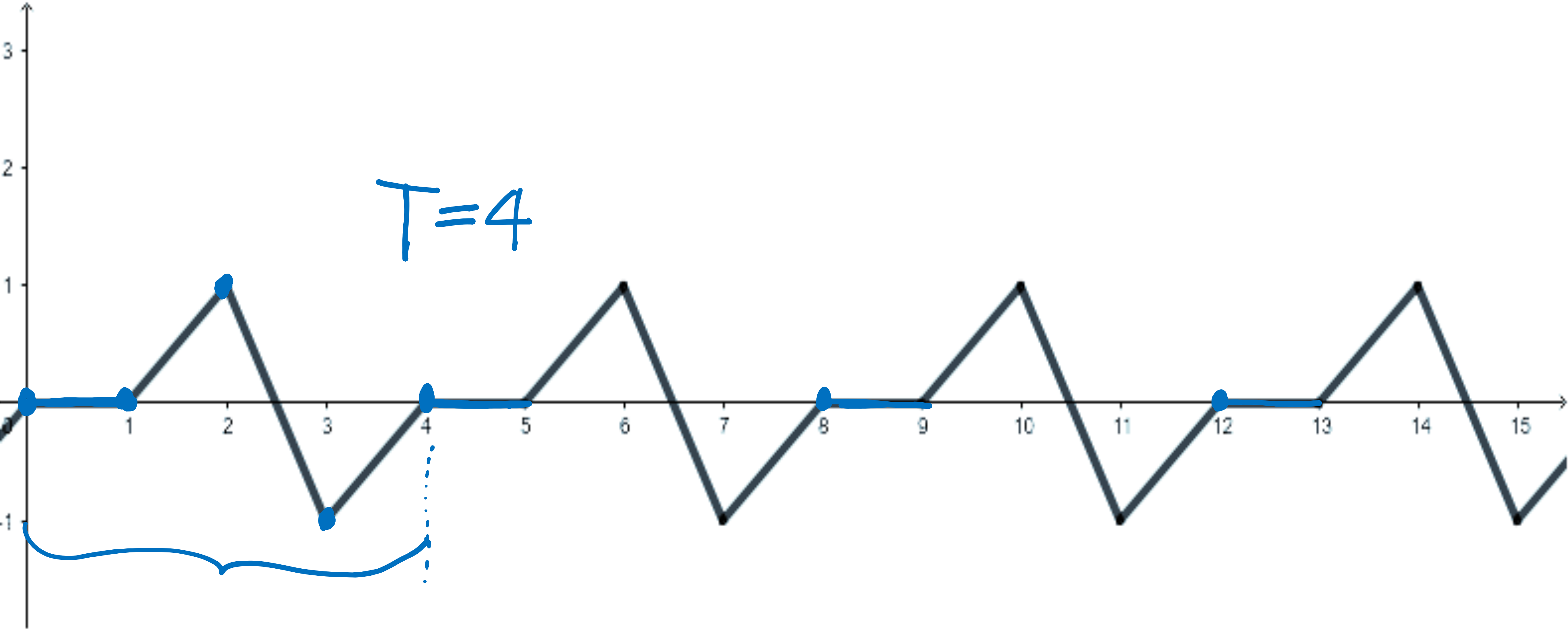
TRANSFORMADA DE UNA FUNCION PERIODICA



$$\mathcal{L}\{\underbrace{f(t)}\} = \int_0^T e^{-st} f(t)\, dt + \int_T^\infty e^{-st} f(t)\, dt. \qquad \overset{T}{\downarrow} \; t = \underbrace{u} + T, \quad dt = du$$

$$\int_T^\infty e^{-st} f(t)\, \underbrace{dt} = \int e^{-s(u+T)}\, \underbrace{f(u+T)}_{f(u)}\, du$$

$$e^{-su} \cdot \underbrace{e^{-sT}}$$

$$e^{-sT} \underbrace{\int_0^\infty e^{-su} f(u)\, du} = e^{-sT} \mathcal{L}\{f(t)\}.$$

$$\underbrace{\mathcal{L}\{f(t)\}} = \int_0^T e^{-st} f(t)\, dt + e^{-sT} \underbrace{\mathcal{L}\{f(t)\}}.$$

$$\mathcal{L}\{f(t)\} = \frac{1}{1 - e^{-sT}} \underbrace{\int_0^T e^{-st} f(t)\, dt}.$$

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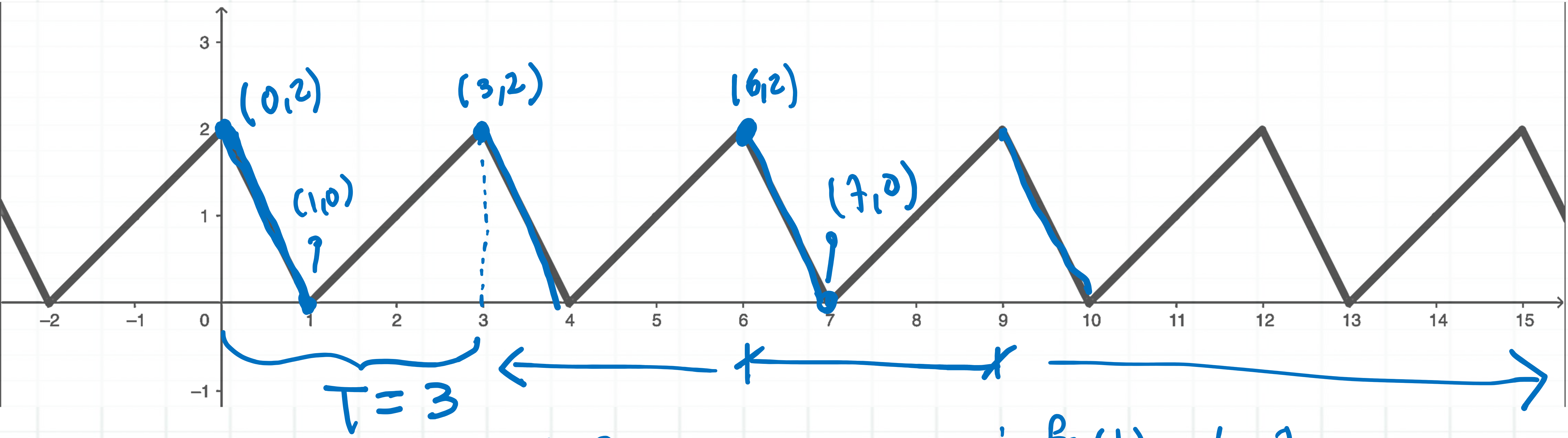
Use la Transformada de Laplace para econtrar la Transfomada de la funcion Periodica:



R1: $P_1(0,2)$ $P_2(1,0)$

$$m = \frac{0-2}{1-0} = -2$$

$$f(t) - 0 = -2(t-1)$$

$$f_1(t) = -2t+2$$

R2: $P_1(1,0)$ $P_2(3,2)$

$$m = \frac{2-0}{3-1} = 1$$

$$f(t) - 0 = (1)(t-1)$$

$$f_2(t) = t-1$$

$$f(t) = \begin{cases} -2t+2 & \text{si } 0 \le t \le 1 \\ t-1 & \text{si } 1 \le t \le 3 \end{cases}$$

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$$\mathcal{L}\{f(t)\} = \left(\frac{1}{1-e^{-s(3)}}\right)\left[\int_0^1 e^{-st}\cdot(-2t+2)\,dt + \int_1^3 e^{-st}(t-1)\,dt\right]$$

d	$\int$
$-2t+2$	e^{-st}
-2	$-\frac{1}{s}e^{-st}$
0	$\frac{1}{s^2}e^{-st}$

$$F(s) = \left(\frac{1}{1-e^{-3s}}\right)\left[\left(-\frac{(-2t+2)}{s}e^{-st} + \frac{2}{s^2}e^{-st}\Big|_0^1\right) + \left(-\frac{(t-1)}{s}e^{-st} - \frac{1}{s^2}e^{-st}\Big|_1^3\right)\right]$$

$$F(s) = \left(\frac{1}{1-e^{-3s}}\right)\left[\frac{2}{s^2}e^{-s} + \frac{2}{s} - \frac{2}{s^2} - \frac{2}{s}e^{-3s} - \frac{1}{s^2}e^{-3s} + \frac{1}{s^2}e^{-s}\right]$$

d	$\int$
$t-1$	e^{-st}
1	$-\frac{1}{s}e^{-st}$
0	$\frac{1}{s^2}e^{-st}$

$$F(s) = \left(\frac{1}{1-e^{-3s}}\right)\left[\frac{3}{s^2}e^{-s} + \frac{2}{s} - \frac{2}{s^2} - \frac{2}{s}e^{-3s} - \frac{1}{s^2}e^{-3s}\right]$$

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