$f(t) = t$ $\qquad\qquad T = 2\pi \; ; \; \frac{T}{2} = L$

Necesitamos hallar los coeficientes $a_0$, $a_n$ y $b_n$ de la serie de la función.

$$a_0 = \frac{1}{T/2}\int_{-T/2}^{T/2} f(t)\,dt$$

$$a_n = \frac{1}{T/2}\int_{-T/2}^{T/2} f(t)\cos\left(\frac{n\pi t}{L}\right)dt$$

$$b_n = \frac{1}{T/2}\int_{-T/2}^{T/2} f(t)\sin\left(\frac{n\pi t}{L}\right)dt$$

$$a_0 = \frac{1}{\pi}\int_{-\pi}^{\pi} t\,dt = \frac{t^2}{\pi}\Big|_{-\pi}^{\pi} = 0$$

$$a_n = \frac{1}{\pi}\int_{-\pi}^{\pi} t\cos\left(\frac{n\cancel{\pi}t}{\cancel{L}}\right)dt$$

$t$ es una función impar, cos es una función par por lo que $t\cos(nt)$ es impar, y la integral de una función impar entre $-A$ y $A$ es $0$

$a_n = 0$

$$\bullet\ b_n = \frac{1}{\pi}\int_{-\pi}^{\pi} t\sin(nt)\,dt = -\frac{t\cos(nt)}{n\pi}\Big|_{-\pi}^{\pi} + \ldots\ldots$$

$$\frac{1}{n\pi}\int_{-\pi}^{\pi}\cos(nt)\,dt = -\frac{2\pi\cos(n\pi)}{n\pi} + \sin(nt)\frac{1}{n^2\pi}\Big|_{-\pi}^{\pi}$$

$$b_n = \frac{2(-1)^{n+1}}{n}$$

$$f(t) = \cancel{\frac{A_0}{2}} + \sum_{n=1}^{\infty} \cancel{A_n\cos\left(\frac{n\pi t}{t}\right)} + B_n\sin\left(\frac{n\pi t}{t}\right)$$

$$f(t) = 2\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n}\sin(n\pi t/t)$$