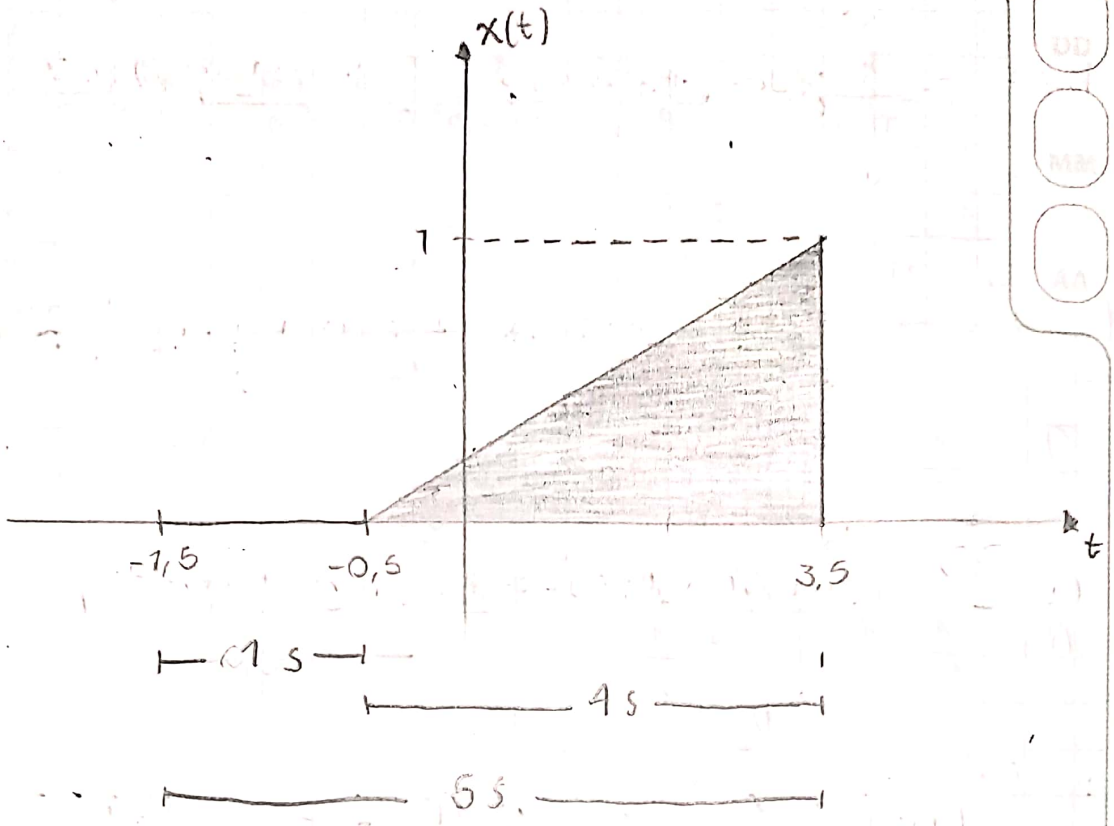

$T_0 = 5\,s \qquad f_0 = \frac{1}{5}\,Hz$

$$x(t) = \begin{cases} 0 & -3/2 < t \leq -1/2 \\ \frac{1}{4}t + \frac{1}{8} & -1/2 < t \leq 3/2 \end{cases}$$

$$a_n = \frac{2}{T_0}\int_{T_0} x(t)\cos(2\pi n f_0 t)\,dt$$

$$a_n = \frac{2}{5}\int_{-3/2}^{3/2} x(t)\cos(2\pi n f_0 t)\,dt$$

$$a_n = \frac{2}{5}\int_{-3/2}^{-1/2} 0\cos(2\pi n f_0 t)\,dt + \frac{2}{5}\int_{-1/2}^{7/2}\left(\frac{1}{4}t+\frac{1}{8}\right)\cos(2\pi n f_0 t)\,dt$$

$$a_n = \frac{2}{5}(0) + \frac{2}{5}\int_{-1/2}^{7/2}\frac{1}{4}t\cos(2\pi n f_0 t)\,dt + \frac{2}{5}\int_{-1/2}^{7/2}\frac{1}{8}\cos(2\pi n f_0 t)\,dt$$

$$a_n = \frac{1}{10}\int_{-1/2}^{7/2} t\cos(2\pi n f_0 t)\,dt + \frac{1}{20}\int_{-1/2}^{7/2}\cos(2\pi n f_0 t)\,dt$$

$$\int_{-1/2}^{7/2} t\cos(2\pi n f_0 t)\,dt \qquad u = t \quad dv = \cos(2\pi n f_0 t)\,dt$$

$$du = dt \quad v = \frac{\operatorname{sen}(2\pi n f_0 t)}{2\pi n f_0}$$

$$= \frac{t\operatorname{sen}(2\pi n f_0 t)}{2\pi n f_0}\Bigg|_{-1/2}^{7/2} - \int_{-1/2}^{7/2}\frac{\operatorname{sen}(2\pi n f_0 t)\,dt}{2\pi n f_0}$$

$$= \frac{7}{4\pi n\frac{1}{5}}\operatorname{sen}\left(\frac{7\pi n}{5}\right) - \frac{1}{4\pi n\frac{1}{5}}\operatorname{sen}\left(\frac{\pi n}{5}\right) - \frac{1}{2\pi n f_0}\left(-\frac{\cos(2\pi n f_0 t)}{2\pi n f_0}\Bigg|_{-1/2}^{7/2}\right)$$

$$= \frac{35}{4\pi n}\operatorname{sen}\left(\frac{7\pi n}{5}\right) - \frac{5}{4\pi n}\operatorname{sen}\left(\frac{\pi n}{5}\right) + \frac{25}{4\pi^2 n^2}\cos\left(\frac{7\pi n}{5}\right)$$

$$- \frac{25}{4\pi^2 n^2}\cos\left(\frac{\pi n}{5}\right)$$

$$\text{L} \int_{-1/2}^{7/2} \cos(2\pi n f_0 t)\,dt = \frac{\operatorname{sen}(2\pi n f_0 t)}{2\pi n f_0}\Bigg|_{-1/2}^{7/2}$$

$$= \frac{5}{2\pi n}\operatorname{sen}\left(\frac{7\pi n}{5}\right) + \frac{5}{2\pi n}\operatorname{sen}\left(\frac{\pi n}{5}\right)$$

$$a_n = \frac{1}{10}\left[\frac{35}{4\pi n}\operatorname{sen}\left(\frac{7\pi n}{5}\right) - \frac{5}{4\pi n}\operatorname{sen}\left(\frac{\pi n}{5}\right) + \frac{25}{4\pi^2 n^2}\cos\left(\frac{7\pi n}{5}\right)\right.$$

$$\left. - \frac{25}{4\pi^2 n^2}\cos\left(\frac{\pi n}{5}\right)\right] + \frac{1}{20}\left[\frac{5}{2\pi n}\operatorname{sen}\left(\frac{7\pi n}{5}\right) + \frac{5}{2\pi n}\operatorname{sen}\left(\frac{\pi n}{5}\right)\right]$$

$$a_n = \frac{7}{8\pi n}\operatorname{sen}\left(\frac{7\pi n}{5}\right) - \frac{7}{8\pi n}\operatorname{sen}\left(\frac{\pi n}{5}\right) + \frac{5}{8\pi^2 n^2}\cos\left(\frac{7\pi n}{5}\right)$$

$$- \frac{5}{8\pi^2 n^2}\cos\left(\frac{\pi n}{5}\right) + \frac{1}{8\pi n}\operatorname{sen}\left(\frac{7\pi n}{5}\right) + \frac{1}{8\pi n}\operatorname{sen}\left(\frac{\pi n}{5}\right)$$

$$a_n = \frac{1}{\pi n}\operatorname{sen}\left(\frac{7\pi n}{5}\right) - \frac{5}{8\pi^2 n^2}\cos\left(\frac{\pi n}{5}\right) + \frac{5}{8\pi^2 n^2}\cos\left(\frac{7\pi n}{5}\right)$$

$$a_n = \frac{5}{8\pi^2 n^2}\left[\frac{8\pi n}{5}\operatorname{sen}\left(\frac{7\pi n}{5}\right) - 5\pi n\cos\left(\frac{\pi n}{5}\right) + 5\pi n\cos\left(\frac{7\pi n}{5}\right)\right]$$

$$b_n = \frac{2}{T_0}\int_{T_0}^{7/2} x(t)\sin(2\pi n f_0 t)\,dt$$

$$b_n = \frac{2}{5}\int_{-3/2}^{7/2} x(t)\sin(2\pi n f_0 t)\,dt$$

$$b_n = \frac{2}{5}\int_{-3/2}^{-1/2} 0\,\sin(2\pi n f_0 t)\,dt + \frac{2}{5}\int_{-7/2}^{7/2}\left(\frac{1}{4}t+\frac{1}{8}\right)\sin(2\pi n f_0 t)\,dt$$

$$b_n = \frac{2}{5}(0) + \frac{2}{5}\int_{-1/2}^{7/2}\frac{1}{4}t\sin(2\pi n f_0 t)\,dt + \frac{2}{5}\int_{-1/2}^{7/2}\frac{1}{8}\sin(2\pi n f_0 t)\,dt$$

$$b_n = \frac{1}{10}\int_{-1/2}^{7/2} t\sin(2\pi n f_0 t)\,dt + \frac{1}{20}\int_{-1/2}^{7/2}\sin(2\pi n f_0 t)\,dt$$

↳ $\int_{-1/2}^{7/2} t\sin(2\pi n f_0 t)\,dt$ $\quad u = t \quad dv = \sin(2\pi n f_0 t)\,dt$

$du = dt \quad v = -\dfrac{\cos(2\pi n f_0 t)}{2\pi n f_0}$

$$= -\frac{t\cos(2\pi n f_0 t)}{2\pi n f_0}\Bigg|_{-1/2}^{7/2} - \int_{-1/2}^{7/2} -\frac{\cos(2\pi n f_0 t)}{2\pi n f_0}\,dt$$

$$= -\frac{1}{2\pi n f_0}\left[\frac{7}{2}\cos(7\pi n f_0) + \frac{1}{2}\cos(\pi n f_0)\right] + \frac{1}{4\pi^2 n^2 f_0^2}\operatorname{sen}(2\pi n f_0 t)\Bigg|_{-1/2}^{7/2}$$

$$= -\frac{7}{4\pi n \frac{1}{5}}\cos\left(\frac{7\pi n}{5}\right) - \frac{1}{4\pi n\frac{1}{5}}\cos\left(\frac{\pi n}{5}\right) + \frac{25}{4\pi^2 n^2}\operatorname{sen}\left(\frac{7\pi n}{5}\right)$$

$$+ \frac{25}{4\pi^2 n^2}\operatorname{sen}\left(\frac{\pi n}{5}\right)$$

$$\int_{-1/2}^{7/2} \operatorname{sin}(2\pi n f_0 t)\,dt = \frac{-\cos(2\pi n f_0 t)}{2\pi n f_0}\Bigg|_{-1/2}^{7/2}$$

$$= -\frac{\cos(7\pi n f_0)}{2\pi n f_0} + \frac{\cos(\pi n f_0)}{2\pi n f_0}$$

$$= -\frac{5}{2\pi n}\cos\left(\frac{7\pi n}{5}\right) + \frac{5}{2\pi n}\cos\left(\frac{\pi n}{5}\right)$$

$$b_n = \frac{1}{10}\left[\frac{-35}{4\pi n}\cos\left(\frac{7\pi n}{5}\right) - \frac{5}{4\pi n}\cos\left(\frac{\pi n}{5}\right) + \frac{25}{4\pi^2 n^2}\operatorname{sen}\left(\frac{7\pi n}{5}\right)\right.$$

$$\left. + \frac{25}{4\pi^2 n^2}\operatorname{sen}\left(\frac{\pi n}{5}\right)\right] + \frac{1}{20}\left[-\frac{5}{2\pi n}\cos\left(\frac{7\pi n}{5}\right) + \frac{5}{2\pi n}\cos\left(\frac{\pi n}{5}\right)\right]$$

$$= -\frac{7}{8\pi n}\cos\left(\frac{7\pi n}{5}\right) - \frac{1}{8\pi n}\cos\left(\frac{\pi n}{5}\right) + \frac{5}{8\pi^2 n^2}\operatorname{sen}\left(\frac{7\pi n}{5}\right)$$

$$+ \frac{5}{8\pi^2 n^2}\operatorname{sen}\left(\frac{\pi n}{5}\right) - \frac{1}{8\pi n}\cos\left(\frac{7\pi n}{5}\right) + \frac{1}{8\pi n}\cos\left(\frac{\pi n}{5}\right)$$

$$b_n = -\frac{1}{4\pi n}\cos\left(\frac{7\pi n}{5}\right) + \frac{5}{8\pi^2 n^2}\operatorname{sen}\left(\frac{7\pi n}{5}\right) + \frac{5}{8\pi^2 n^2}\operatorname{sen}\left(\frac{\pi n}{5}\right)$$

$$a_0 = \frac{1}{T_0}\int_{T_0} x(t)\,dt = \frac{1}{5}\int_{-3/2}^{7/2} x(t)\,dt$$

$$= \frac{1}{5}\int_{-3/2}^{-1/2} \emptyset\,dt + \frac{1}{5}\int_{-1/2}^{7/2} \frac{1}{4}t + \frac{1}{8}\,dt$$

$$= \frac{1}{5}(\emptyset) + \frac{1}{5}\int_{-1/2}^{7/2} \frac{1}{4}t\,dt + \frac{1}{5}\int_{-1/2}^{7/2} \frac{1}{8}\,dt$$

$$= \frac{1}{20}\,\frac{t^2}{2}\Big|_{-1/2}^{7/2} + \frac{1}{40}\,t\Big|_{-1/2}^{7/2} = \frac{1}{40}\,\frac{49}{4} - \frac{1}{40}\,\frac{1}{4} + \frac{7}{80} + \frac{1}{80}$$

$$= \frac{49}{160} - \frac{1}{160} + \frac{7}{80} - \frac{1}{80} = \frac{48}{160} + \frac{6}{80} = \frac{3}{10} + \frac{3}{40} = \frac{3}{8}$$

$$b_n = \frac{5}{8\pi^2 n^2}\left[-\frac{8\pi n}{5}\cos\left(\frac{7\pi n}{5}\right) + 5\sin\left(\frac{7\pi n}{5}\right) + 5\sin\left(\frac{\pi n}{5}\right)\right]$$