$$x(t) = \frac{1}{4}t + \frac{1}{8} \qquad T_0 = 4$$

$$f_0 = \frac{1}{4}$$

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

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

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

$$a_n = \frac{1}{8}\int_{-T/2}^{T/2} t\cos(2\pi n f_0 t)\,dt + \frac{1}{16}\int_{-T/2}^{T/2}\cos(2\pi n f_0 t)\,dt$$

$$\hookrightarrow \frac{1}{8}\int_{-T/2}^{T/2} t\cos(2\pi n f_0 t)\,dt$$

$$u = t \qquad dv = \cos(2\pi n f_0 t)\,dt$$

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

$$= \frac{1}{8}\left[\frac{t}{2\pi n f_0} \operatorname{sen}(2\pi n f_0 t)\Big|_{-1/2}^{7/2} - \int_{-1/2}^{7/2} \frac{1}{2\pi n f_0} \operatorname{sen}(2\pi n f_0 t)\, dt\right]$$

$$= \frac{1}{8}\left[\frac{7}{4\pi n f_0} \operatorname{sen}(7\pi n f_0) - \frac{1}{4\pi n f_0} \operatorname{sen}(\pi n f_0) - \frac{1}{2\pi n f_0}\left(\frac{-\cos(2\pi n f_0 t)}{2\pi n f_0}\Big|_{-1/2}^{7/2}\right)\right]$$

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

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

$$\hookrightarrow \frac{1}{16}\int_{-1/2}^{7/2} \cos(2\pi n f_0 t)\, dt$$

$$= \frac{1}{16} \frac{\operatorname{sen}(2\pi n f_0 t)}{2\pi n f_0}\Big|_{-1/2}^{7/2} = \frac{1}{32\pi n f_0}\left(\operatorname{sen}(7\pi n f_0) + \operatorname{sen}(\pi n f_0)\right)$$

$$= \underline{\frac{1}{8\pi n} \operatorname{sen}\left(\frac{7\pi n}{4}\right) + \frac{1}{8\pi n} \sin\left(\frac{\pi n}{4}\right)}$$

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

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

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

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

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

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

$$b_n = \frac{1}{8} \int_{-1/2}^{7/2} t \sin(2\pi n f_0 t)\, dt + \frac{1}{16} \int_{-1/2}^{7/2} \sin(2\pi n f_0 t)\, dt$$

$$\hookrightarrow \frac{1}{8}\int_{-1/2}^{7/2} t\sin(2\pi n f_0 t)\,dt$$

$$u = t \qquad dV = \sin(2\pi n f_0 t)\,dt$$

$$du = dt \qquad V = -\frac{\cos(2\pi n f_0 t)}{2\pi n f_0}$$

$$= \frac{1}{8}\left[-\frac{t}{2\pi n f_0}\cos(2\pi n f_0 t)\Big|_{-1/2}^{7/2} - \int_{-1/2}^{7/2} -\frac{\cos(2\pi n f_0 t)\,dt}{2\pi n f_0}\right]$$

$$= \frac{1}{8}\left[-\frac{7}{4\pi n f_0}\cos(7\pi n f_0) - \frac{1}{4\pi n f_0}\cos(\pi n f_0) + \frac{1}{2\pi n f_0} \dots\right.$$

$$\left.\int_{-1/2}^{7/2}\cos(2\pi n f_0 t)\,dt\right]$$

$$= \frac{1}{8}\left[-\frac{7}{4\pi n f_0}\cos(7\pi n f_0) - \frac{1}{4\pi n f_0}\cos(\pi n f_0) + \frac{1}{2\pi n f_0} \dots\right.$$

$$\left.\left(\frac{\operatorname{sen}(2\pi n f_0 t)}{2\pi n f_0}\right)\Big|_{-1/2}^{7/2}\right]$$

$$= \frac{1}{8}\left[-\frac{7}{4\pi n f_0}\cos(7\pi n f_0) - \frac{1}{4\pi n f_0}\cos(\pi n f_0) + \frac{1}{4\pi^2 n^2 f_0^2} \dots\right.$$

$$\left.\left(\operatorname{sen}(7\pi n f_0) + \operatorname{sen}(\pi n f_0)\right)\right]$$

$$= \frac{1}{8}\left[-\frac{7}{\pi n}\cos\left(\frac{7\pi n}{4}\right) - \frac{1}{\pi n}\cos\left(\frac{\pi n}{4}\right) + \dots \right.$$

$$\left. \frac{4}{\pi^2 n^2}\operatorname{sen}\left(\frac{7\pi n}{4}\right) + \frac{4}{\pi^2 n^2}\operatorname{sen}\left(\frac{\pi n}{4}\right)\right]$$

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

$$+ \frac{1}{2\pi^2 n^2}\operatorname{sen}\left(\frac{7\pi n}{4}\right)]$$

$$\hookrightarrow \frac{1}{16}\int_{-1/2}^{7/2} \sin(2\pi n f_0 t)\,dt$$

$$= \frac{1}{16}\left(-\frac{\cos(2\pi n f_0 t)}{2\pi n f_0}\Bigg|_{-1/2}^{7/2}\right) = -\frac{1}{32\pi n f_0}\Big(\cos(7\pi n f_0)$$

$$- \cos(\pi n f_0)\Big)$$

$$= \frac{-1}{16}\frac{/1}{8\pi n}\cos\left(\frac{7\pi n}{4}\right) + \frac{1}{8\pi n}\cos\left(\frac{\pi n}{4}\right)$$

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

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

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

$$\frac{1}{2\pi^2 n^2}\operatorname{sen}\left(\frac{7\pi n}{4}\right).$$

$$a_0 = \frac{1}{T_0}\int_{T_0} x(t)\,dt \rightarrow a_0 = \frac{1}{4}\int_{-1/2}^{7/2} \frac{1}{4}t + \frac{1}{8}\,dt$$

$$a_0 = \frac{1}{16}\frac{t^2}{2}\Bigg|_{-1/2}^{7/2} + \frac{1}{32}\,t\Bigg|_{-1/2}^{7/2}$$

$$a_0 = \frac{1}{32}\left(\frac{49}{4} - \frac{1}{4}\right) + \frac{1}{32}\left(\frac{7}{2} + \frac{1}{2}\right)$$

$$a_0 = \frac{1}{32}\left(\frac{48}{4}\right) + \frac{1}{32}(4) \rightarrow a_0 = \frac{12}{32} + \frac{1}{8}$$

$$a_0 = \frac{1}{2}$$