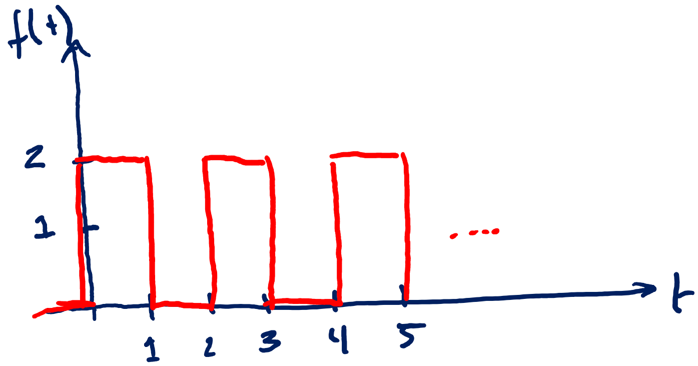
5. Calculate the Fourier coefficients a_0, a_1, a_2, a_3, b_1, b_2, and b_3 for the periodic function $f(t) = 2u(t) - 2u(t+1) + 2u(t+2) - 2u(t+3) + \cdots$.



So the period is $T = 2$

$$a_0 = \frac{1}{T}\int_0^T f(t)\,dt = \frac{1}{2}\int_0^1 2\,dt = \boxed{1 = a_0}$$

The fundamental frequency is $\omega_0 = \frac{2\pi}{T} = \pi$ rad/sec

$$a_n = \frac{2}{T}\int_0^T f(t)\cos(n\omega_0 t)\,dt \quad \text{where } f(t) = \begin{cases} 2, & 0<t<1 \\ \emptyset, & 1<t<2 \end{cases}$$

$$= \frac{2}{T}\int_0^1 2\cos(n\omega_0 t)\,dt = \frac{4}{T}\left[\frac{1}{n\omega_0}\sin(n\omega_0 t)\right]\Big|_0^1$$

$$= \frac{4}{T}\frac{1}{n\omega_0}\left(\underbrace{\sin(n\pi\cdot 1)}_{\emptyset} - \underbrace{\sin(n\cdot\pi\cdot\emptyset)}_{\emptyset}\right)$$

So $\boxed{\text{all } a_n = \emptyset}$

$$b_n = \frac{2}{T}\int_0^T f(t)\sin(n\omega_0 t)\,dt = \frac{4}{T}\int_0^1 \sin(n\omega_0 t)\,dt$$

$$= \frac{4}{T}\frac{1}{n\omega_0}\left[-\cos(n\omega_0 t)\right]\Big|_0^1$$

$$= \frac{4}{2}\frac{1}{n\pi}\left[\underbrace{-\cos(n\pi)}_{=\begin{cases}-1, & n \text{ even} \\ +1, & n \text{ odd}\end{cases}} + \underbrace{\cos(\emptyset)}_{=1}\right]$$

$$\boxed{b_n = \frac{4}{n\pi}}$$

$$\boxed{b_1 = \frac{4}{\pi} \qquad b_2 = \emptyset \qquad b_3 = \frac{4}{3\pi}}$$