(2)

(i) Shifting along t-axis:

when a time shift is applied to a periodic signal $x(t)$, the period T of the signal is preserved. The fourior series co-efficient b_k of the resulting region $y(t) = x(t-t_0)$ may be expressed as

$$b_k = \frac{2}{T} \int_T x(t-t_0)\, e^{-jk\omega_0 t}\, dt$$

Letting $\tau = t - t_0$ in the integral and noting that the new variable τ will also range over an integral of duration T_0

we obtain $\frac{1}{T}\int_T x(\tau)\, e^{-jk\omega_0(\tau+t_0)}d\tau = e^{-jk\omega_0 t}\,\frac{1}{T}$

$$= e^{-jk\omega_0 t_0}\, a_k = e^{-jk(2\pi/T)t_0}\, a_k$$

$$x(t) \xrightarrow{fs} a_k$$

One consequence of this property is that when a periodic signal is shifted in time, the magnitud of its fourier series co-efficient remain unchanget.

Reversal Effect:

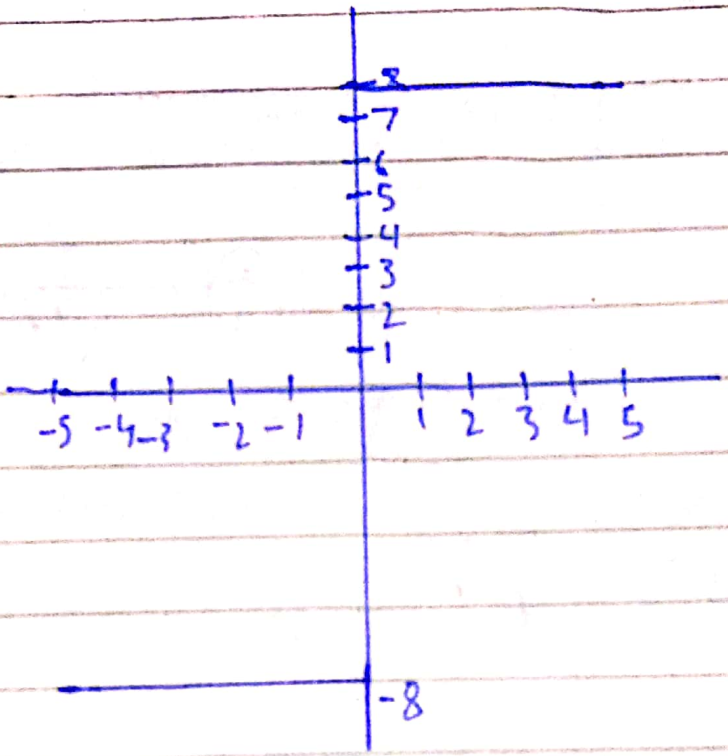
Time reversal applied to a continuous time signal result in a time reversal of corresponding of fourier series co-efficient. An interesting consequence of the time reversal property is that if $x(t)$ is even then its fourier series co-efficients are also even, similarly if x(t) is odd then its fourier series co-efficients are also odd.

Scaling of Independent Variables:
Scaling of independent variable to cause expansion of spectrum if value is huge or if it is other value like 1/2 or some othe fraction value couse compression of spectrum

Multiplying with constants:
Multiplying the spectrum with constant effects the magnitud of signal.

18PWCSE1658

(Q2)(1)



solution:

$$T = 10$$

$$\omega_0 = \frac{2\pi}{T} = \frac{2\pi}{10} = \frac{\pi}{5}$$

$$a_k = \frac{1}{T}\int_{-T_1}^{T_1} e^{-jk\omega_0 t}\,dt$$

$$= -\frac{1}{jk\omega_0 T} e^{-jk\omega_0 t}\Big|_{-T_1}^{T_1}$$

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