For periodic functions $x_1(t)$, $x_2(t)$ with periods T_1 and T_2 respectively, the period of $x_1(t) + x_2(t)$ is $LCM(T_1, T_2)$.
For periodic functions $x_1[n]$, $x_2[n]$ with periods N_1 and N_2 respectively, the period of $x_1[n] + x_2[n]$ is $LCM(N_1, N_2)$.

$$\begin{aligned} E &= \int_{t_1}^{t_2} |x(t)|^2 dt \\ &= \int_{t_1}^{t_2} (x_{Re}(t)^2 + x_{Im}(t)^2) dt. \end{aligned}$$

$$\begin{aligned} E &= \sum_{n=n_1}^{n_2} |x[n]|^2 \\ &= \sum_{n=n_1}^{n_2} (x_{Re}[n]^2 + x_{Im}[n]^2). \end{aligned}$$

$$P_{avg} = \frac{1}{t_2 - t_1} \int_{t_1}^{t_2} |x(t)|^2 dt.$$

$$P_{avg} = \frac{1}{n_2 - n_1 + 1} \sum_{n=n_1}^{n_2} |x[n]|^2.$$

$$P_\infty = \lim_{T \to \infty} \frac{1}{2T} \int_{-T}^{T} |x(t)|^2 dt$$

$$P_\infty = \lim_{N \to \infty} \frac{1}{2N+1} \sum_{n=-N}^{N} |x[n]|^2$$

$$\begin{aligned} x(t) &= x_{even}(t) + x_{odd}(t) \\ &= \frac{x(t) + x(-t)}{2} + \frac{x(t) - x(-t)}{2} \end{aligned}$$

$$\begin{aligned} x[n] &= x_{even}[n] + x_{odd}[n] \\ &= \frac{x[n] + x[-n]}{2} + \frac{x[n] - x[-n]}{2} \end{aligned}$$

$$\begin{aligned} x_k(t) &= e^{jk\omega_0 t}, k \in \mathbb{Z} \\ \omega_0 &= \frac{2\pi}{T}, \text{ period T} \\ x_k[n] &= e^{jk\omega_0 n}, k \in \mathbb{Z} \\ \omega_0 &= \frac{2\pi}{N}, \text{ period N} \end{aligned}$$

- A *memoryless* system depends only on input at time t (or n for DT systems).
- A *linear* system satisfies $S\{ax_1(t) + bx_2(t)\} = aS\{x_1(t)\} + bS\{x_2(t)\}$.
- A system is *time invariant* if a time shift (t_0 or n_0) in the input results in an identical shift in the output.
- A *linear time invariant*'s impulse response h is found by calculating $S(\delta(t))$ (or $S(\delta[n])$). $y(t) = x(t) * h(t)$ (or $y[n] = x[n] * h[n]$).
- A system is *invertible* if there exists an inverse S_2 such that $S_2(S_1(x(t))) = S_1(S_2(x(t))) = x(t)$.
- A system is *causal* if its output at time t (index n) depends only on present and past inputs.
- A system is *stable* if there exist constants $B, M > 0$ such that $|x(t)| < B \ \forall t \implies |y(t)| < M \ \forall t$.