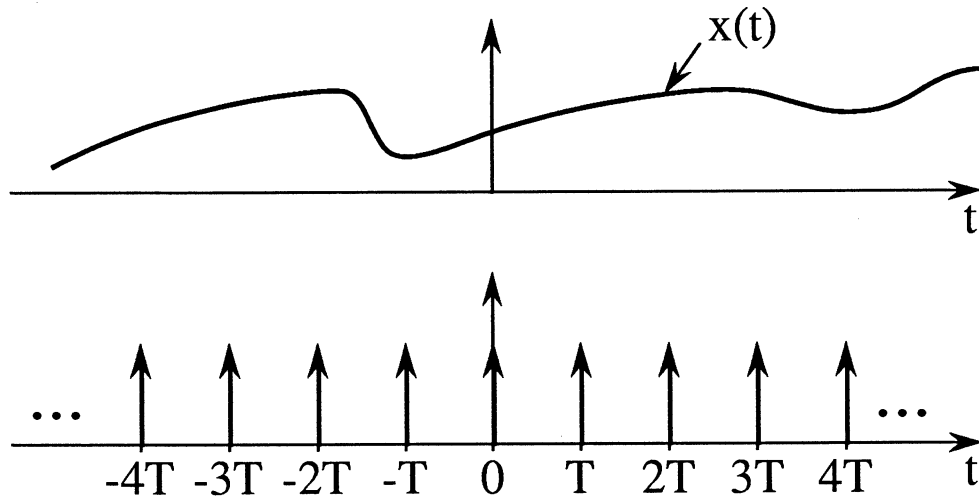


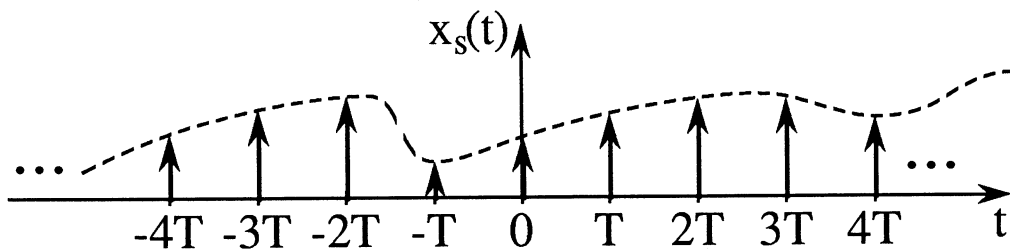
## 1.1.7. COMB AND REPLICATION OPERATORS

Sifting property yields a single sample at  $t_0$ . Consider multiplying  $x(t)$  by an entire train of impulses:



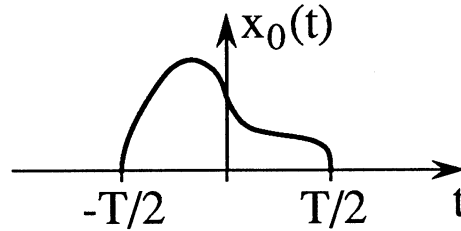
Define

$$\begin{aligned}x_s(t) &= \text{comb}_T[x(t)] = x(t) \sum_n \delta(t - nT) \\ &= \sum_n x(t) \delta(t - nT) \\ &= \sum_n x(nT) \delta(t - nT)\end{aligned}$$

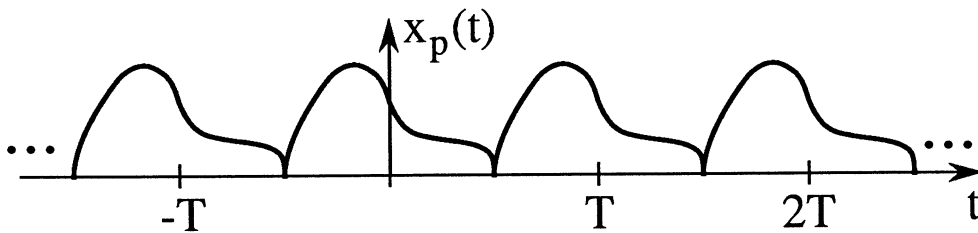


Area of each impulse = value of sample there.

The replication operator similarly provides a compact way to express periodic signals:



$$x_p(t) = \text{rep}_T[x_0(t)] = \sum_n x_0(t - nT)$$



Note that  $x_0(t) = x_p(t)\text{rect}(t/T)$ .