UNIT-1

(Lecture-8)

General Characteristics of Signals

Operations of Signals

- Sometime a given mathematical function may completely describe a signal .
- Different operations are required for different purposes of arbitrary signals.
- The operations on signals can be

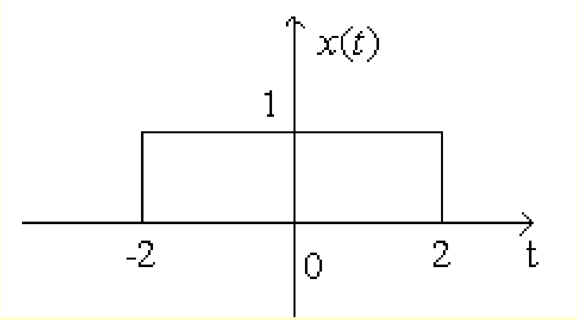
  Time Shifting

  Time Scaling

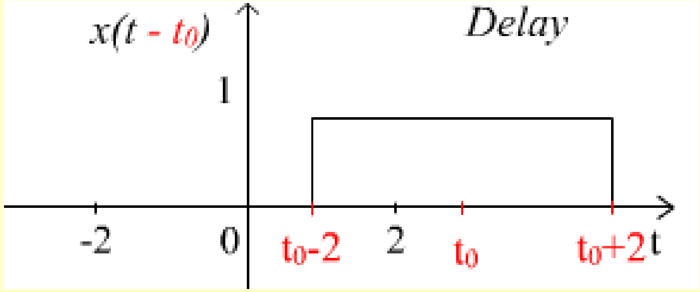
  Time Inversion or Time Folding

Time Shifting

- The original signal $x(t)$ is shifted by an amount t_o.

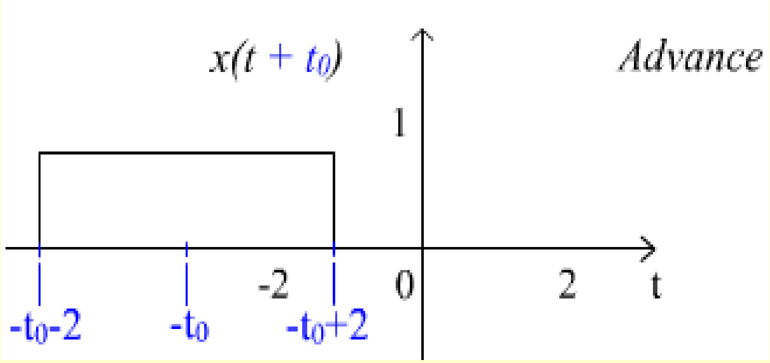


- X(t)→X(t-to) →Signal Delayed→ Shift to the right



Time Shifting Contd.

- X(t)→X(t+to) →Signal Advanced→ Shift to the left

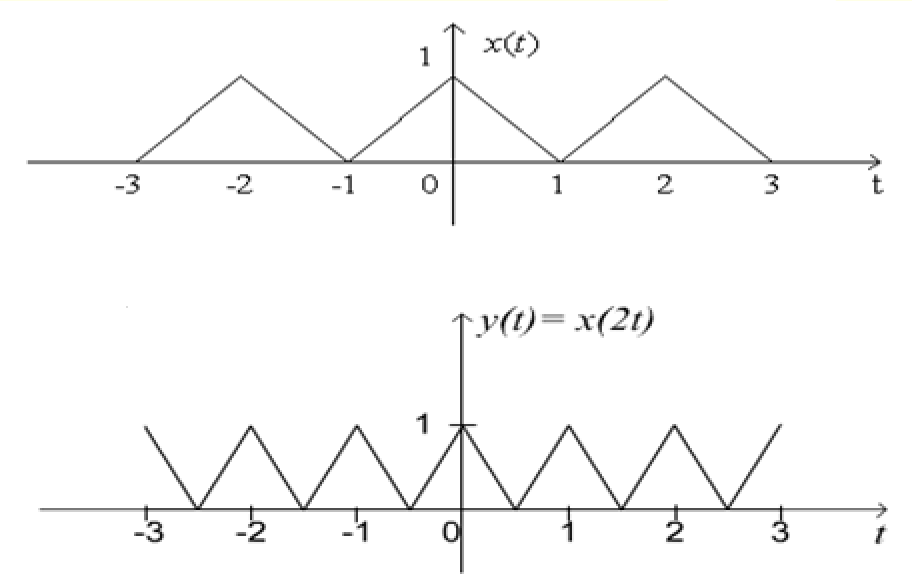


Time Scaling

- For the given function x(t), x(at) is the time scaled version of x(t)
- For a > 1,period of function x(t) reduces and function speeds up. Graph of the function shrinks.
- For a < 1, the period of the x(t) increases and the function slows down. Graph of the function expands.

Time scaling Contd.

Example: Given $x(t)$ and we are to find $y(t) = x(2t)$.

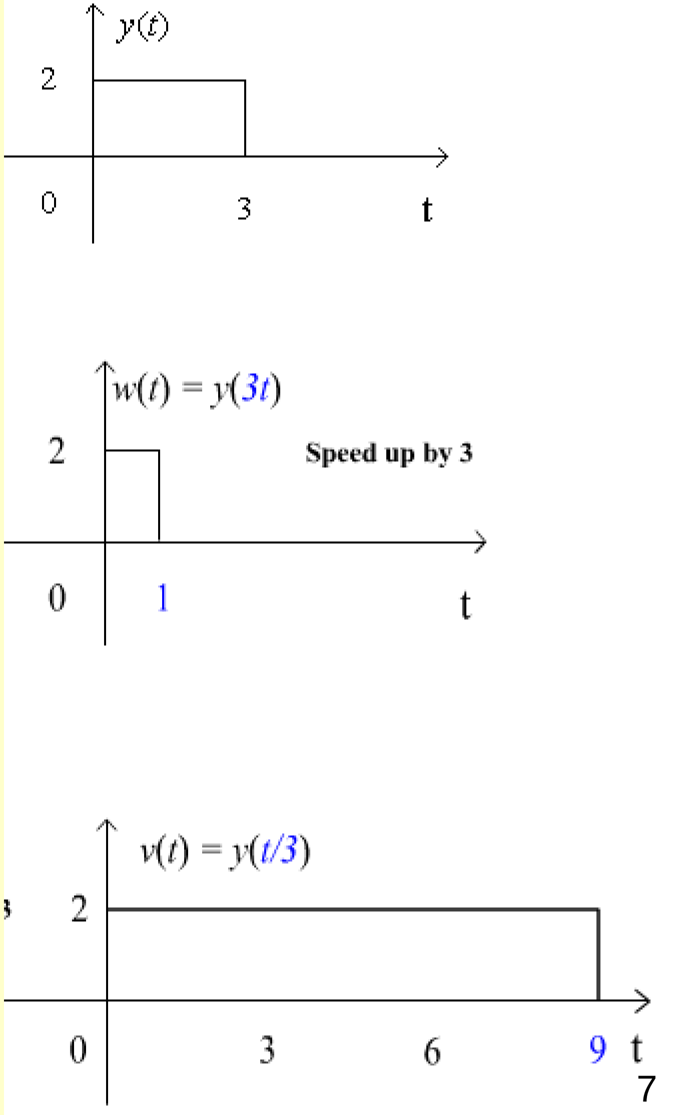


The period of $x(t)$ is 2 and the period of $y(t)$ is 1,

Time scaling Contd.

- Given $y(t)$,
  - find $w(t) = y(3t)$

  $and\ v(t) = y(t/3)$.

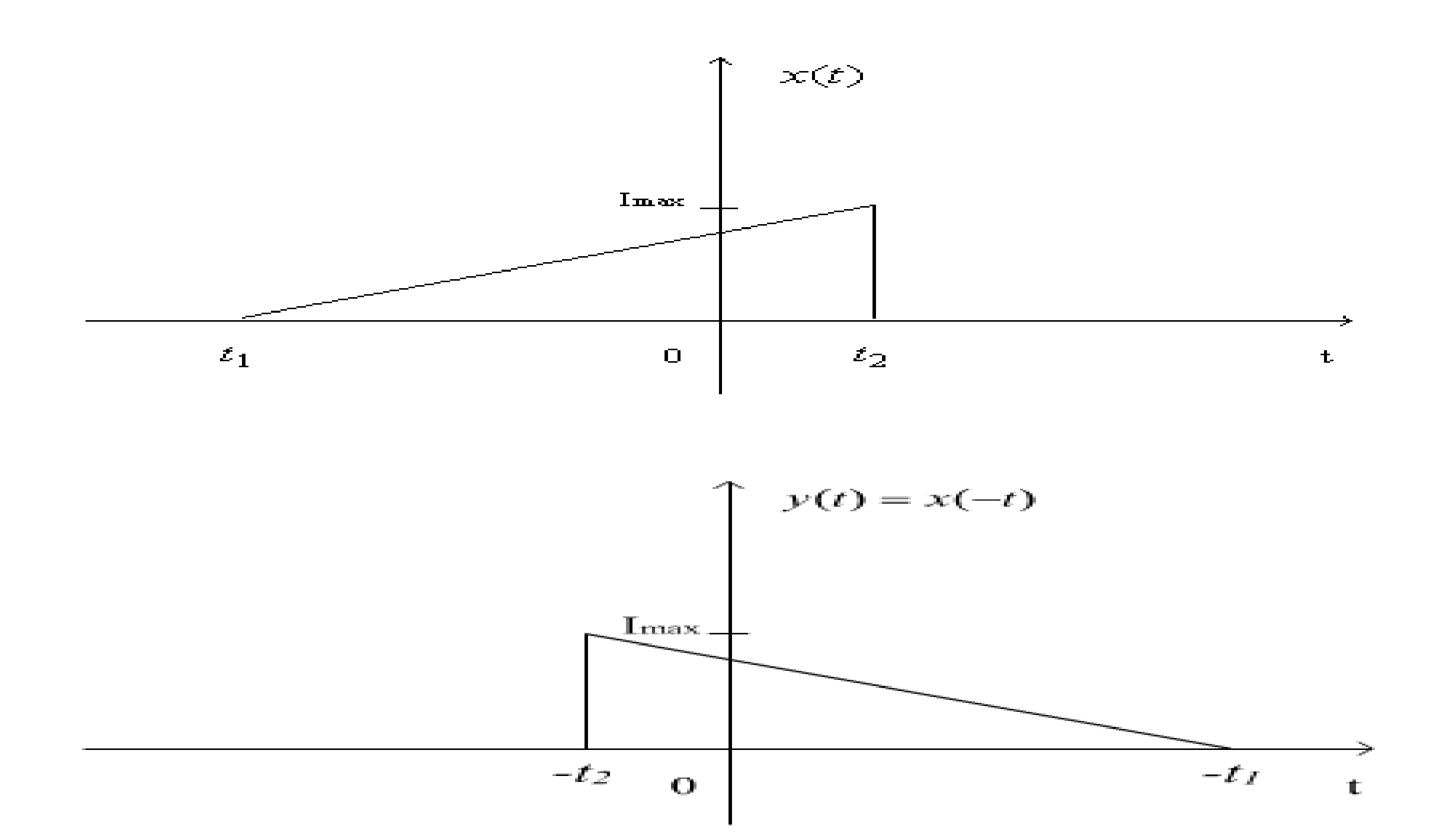


Time Reversal

- Time reversal is also called time folding
- In Time reversal signal is reversed with respect to time i.e.

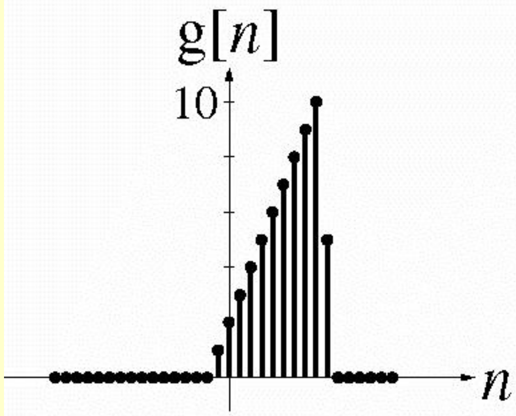
$y(t) = x(-t)$ is obtained for the given function

Time reversal Contd.

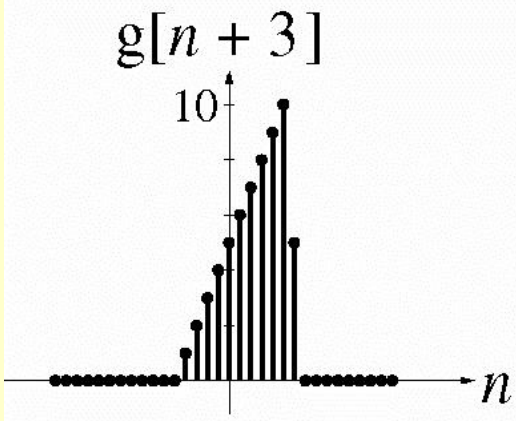


Operations of Discrete Time Functions

Time shifting $n \to n + n_0,\ n_0$ an integer



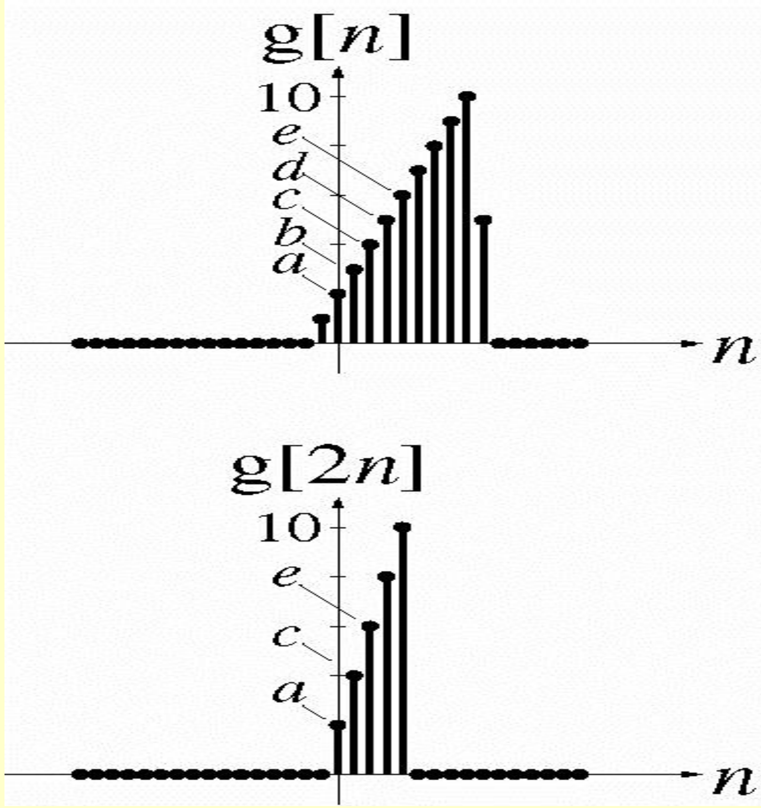
n	$g[n]$
−1	1
0	2
1	3
2	4
3	5
4	6
5	7
6	8
7	9
8	10
9	5
10	0



n	$n+3$	$g[n+3]$
−4	−1	1
−3	0	2
−2	1	3
−1	2	4
0	3	5
1	4	6
2	5	7
3	6	8
4	7	9
5	8	10
6	9	5
7	10	0

Operations of Discrete Functions Contd.
Scaling; Signal Compression

$n \rightarrow Kn$ ***K* an integer > 1**



n	$2n$	g[$2n$]
0	0	2
1	2	4
2	4	6
3	6	8
4	8	10