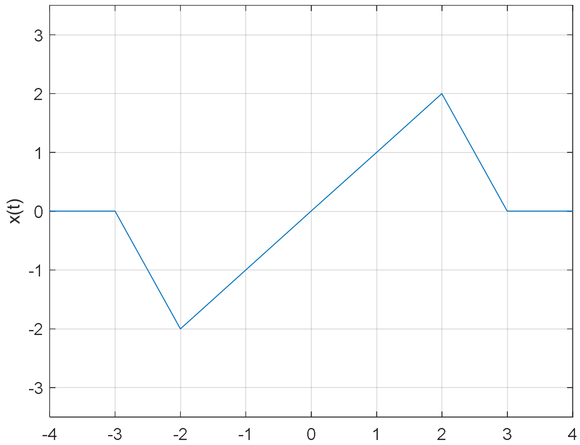
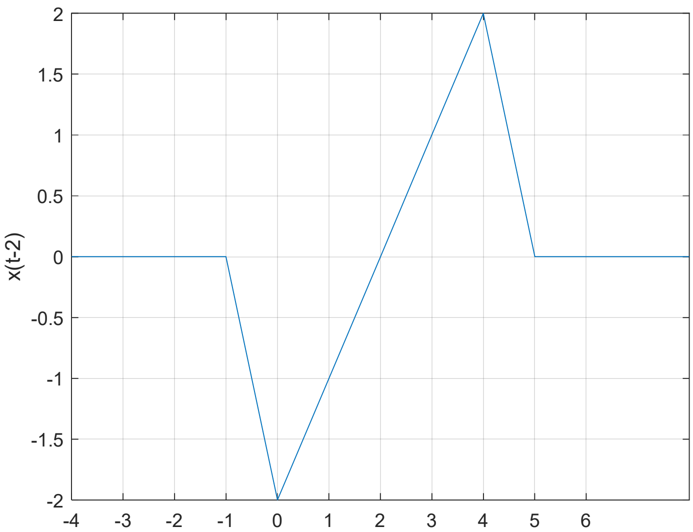
Solutions to ‘’Basic signals and basic operations with signals

For continuous-time signals

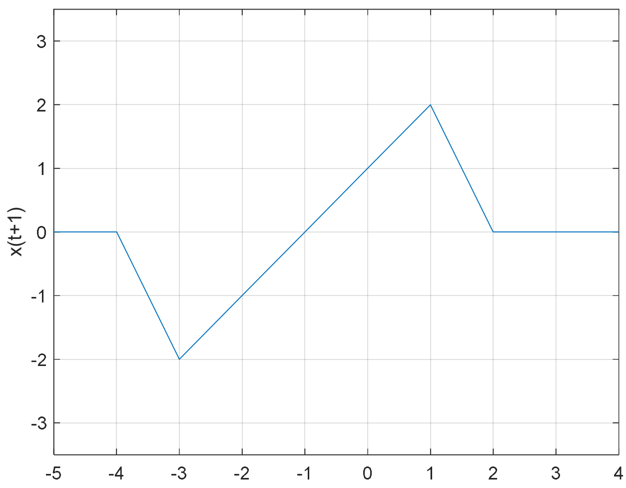
Given the signal x(t) shown in the figure, plot the following signals:



a. x(t-2): the signals suffers a delay of 2 s (everything happens 2 seconds later).

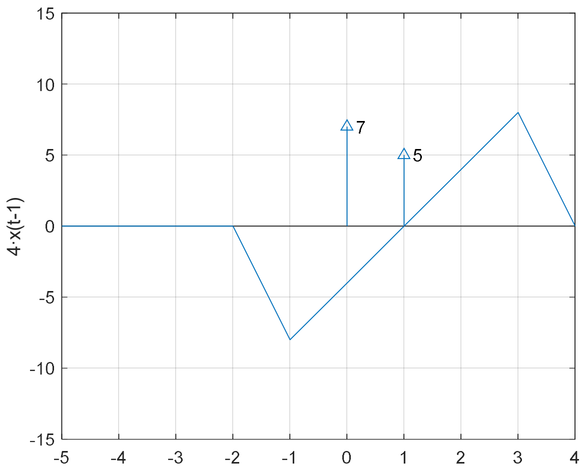


b. x(t+1): the signal is advanced 1 s. Everything happens 1 second before.



c. $4x(t-1)+7\delta(t)+5\delta(t-1)$

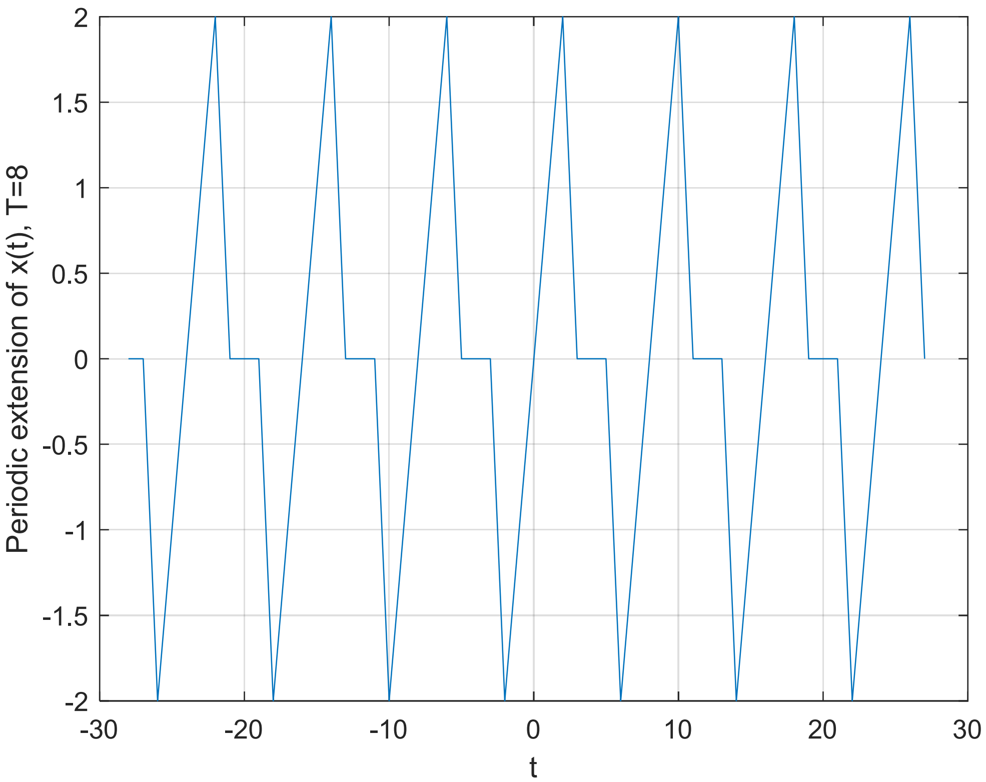
When adding a delta function (we just represent the function in the same graphic, at the corresponding point, and we add the area of the delta next to it. Usually, if possible, we also represent the delta with a 'height' proportional to the area.



d.

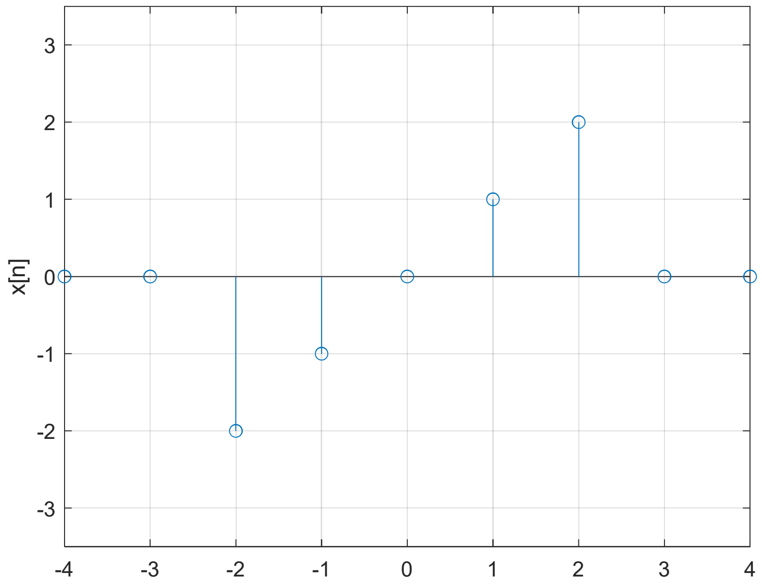
$$\sum_{k} x(t-k8)$$

This is the periodic extension of x(t) with period 8. We must represent x(t-k8) for every value of k –k is an integer number: x(t), x(t-8), x(t-16)…, x(t+8, x(t+16)… etc (theoretically an infinite number of values) and then we add all the terms. In the graphic we have represented from k=-3 to k=+3

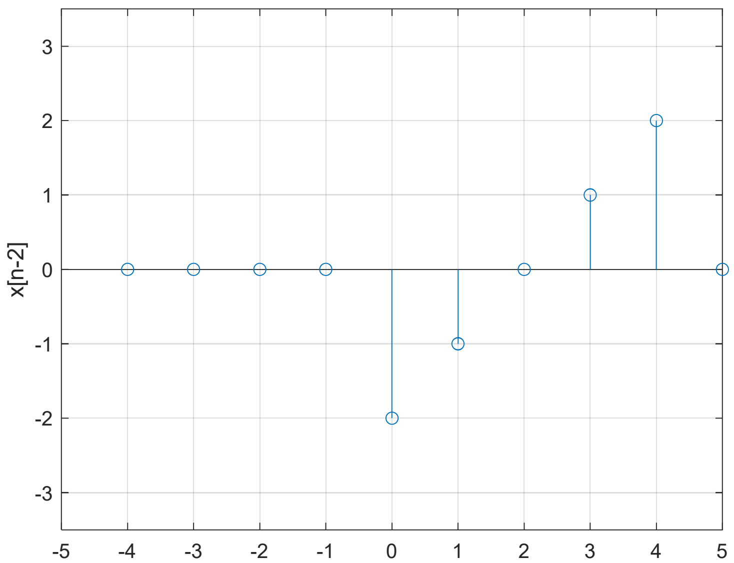


For discrete-time signals

Given the discrete signal x[n] shown in the figure, plot the following signals:

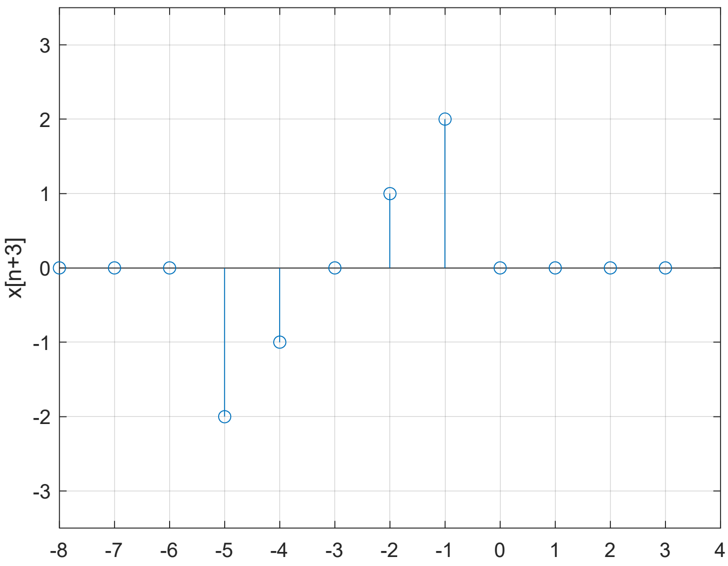


a. x[n-2]: This is a delay of 2 samples. Everything happens 2 samples later.



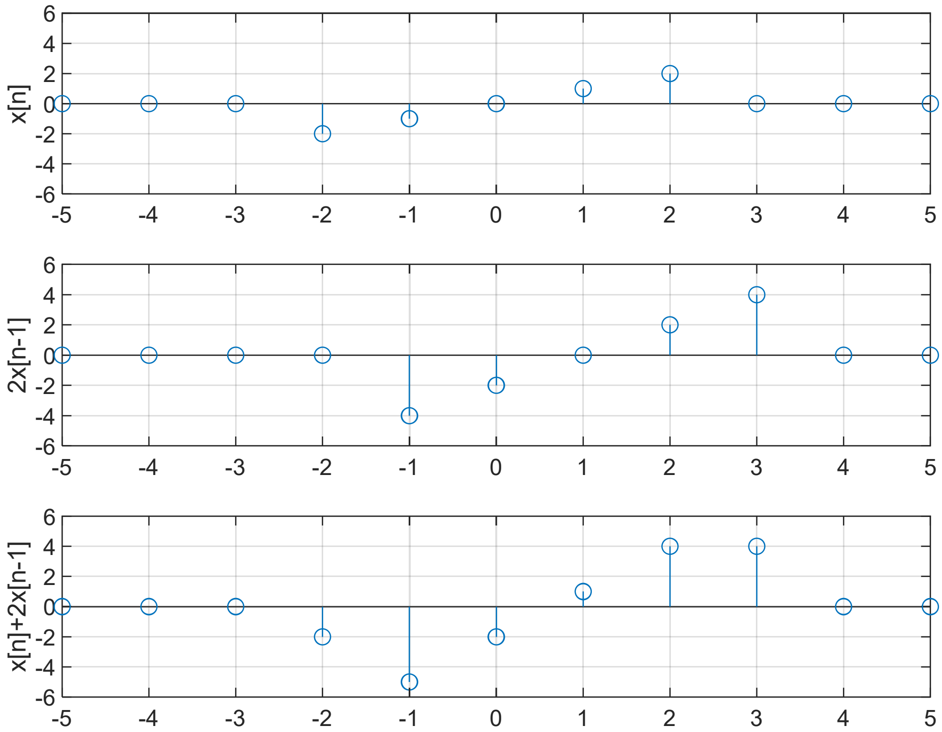
b. x[n+3]

This is an advance of 3 samples. Everything happens 3 samples before:



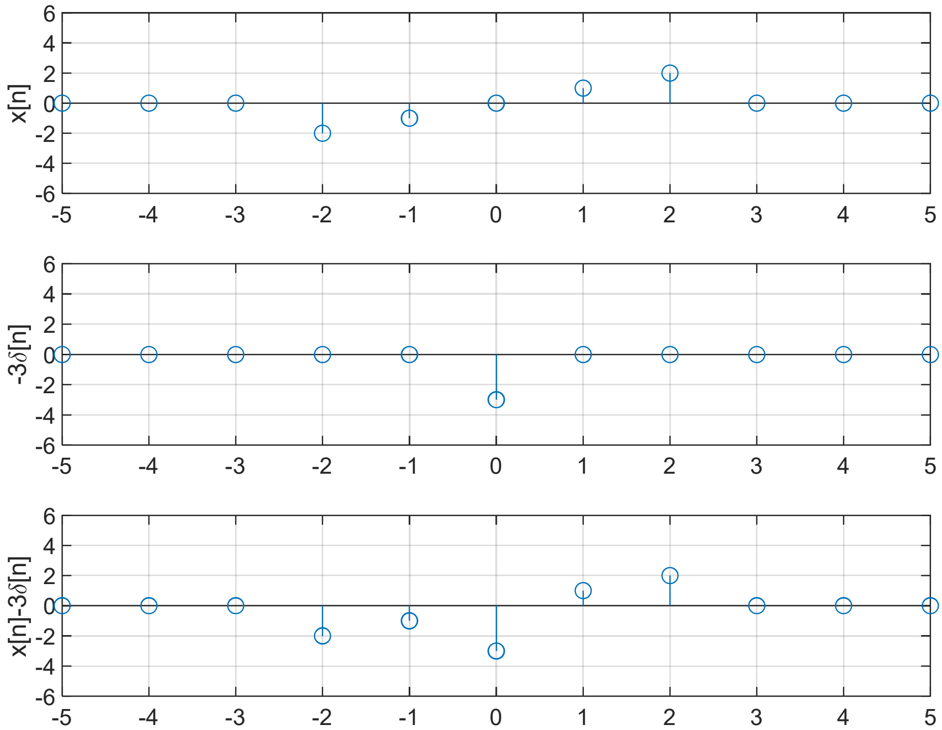
c. x[n]+2x[n-1]

Here we first form 2x[n-1] and the we add the two sequences:



d. $3x[n]-3\delta[n]$

We have to add a sample of value (-3) to x[0]:



e.

$$\sum_k x[n-k7]$$

This is the periodic extension of the sequence x[n] with period 7. We have to form the sequences x[n], x[n-7], x[n-14]… x[n+7], x[n+14]… (theoretically, up to infinite), and add them all.