

2.1. Let $x[n] = \delta[n] + 2\delta[n-1] - \delta[n-3]$ and $h[n] = 2\delta[n+1] + 2\delta[n-1]$

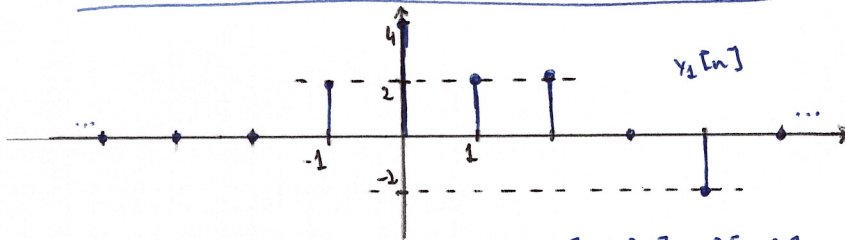
Compute and plot these convolutions:

a) $y_1[n] = x[n] * h[n] = (\delta[n] + 2\delta[n-1] - \delta[n-3]) * (2\delta[n+1] + 2\delta[n-1]) =$

$$= \delta[n] * 2\delta[n+1] + \delta[n] * 2\delta[n-1] + 2\delta[n-1] * 2\delta[n+1] + 2\delta[n-1] * 2\delta[n-1] - \delta[n-3] * 2\delta[n+1] - \delta[n-3] * 2\delta[n-1] =$$

$$= 2\delta[n+1] + 2\delta[n-1] + 4\delta[n] + 4\delta[n-2] - 2\delta[n-2] - 2\delta[n-4] =$$

$$= 2\delta[n+1] + 4\delta[n] + 2\delta[n-1] + 2\delta[n-2] - 2\delta[n-4]$$

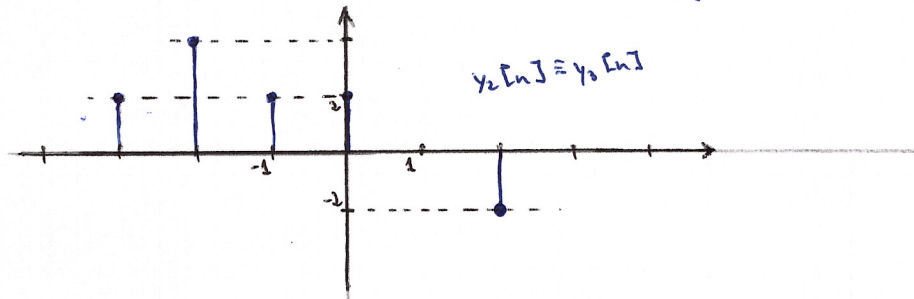


$$= \delta[n+2] * x[n] * h[n] = \delta[n+2] * y_1[n] = y_1[n+2]$$

b) $y_2[n] = x[n+2] * h[n] = (\delta[n+2] + 2\delta[n+1] - \delta[n-1]) * (2\delta[n+1] + 2\delta[n-1]) =$

$$= 2\delta[n+3] + 2\delta[n+1] + 4\delta[n+2] + 4\delta[n] - 2\delta[n] - 2\delta[n-2] =$$

$$= 2\delta[n+3] + 4\delta[n+2] + 2\delta[n+1] + 2\delta[n] - 2\delta[n-2]$$



c) $y_3[n] = x[n] * h[n+2] = x[n] * (h[n] * \delta[n+2]) = y_1[n] * \delta[n+2] = y_1[n+2] = y_2[n]$