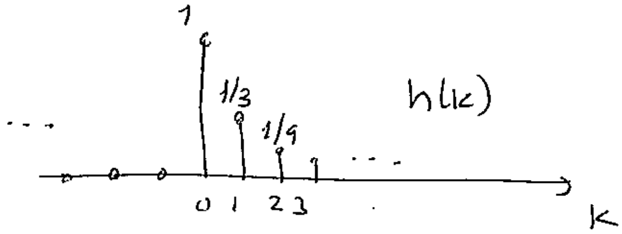
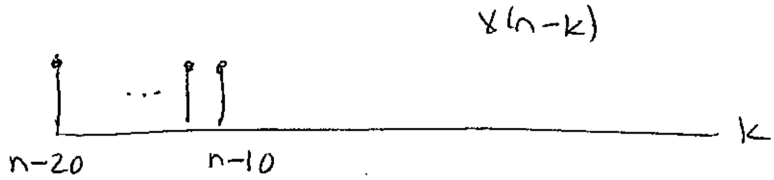
7.

$$h(n) = 3^{-n} u(n) = \left(\frac{1}{3}\right)^n u(n)$$

$$x(n) = \begin{cases} 4, & 10 \le n \le 20 \\ 0; & \text{caso contrário} \end{cases}$$

$$y(n) = x(n) * h(n)$$
$$= h(n) * x(n) \quad \text{pois a convolução é comutativa}$$
$$= \sum_{k=-\infty}^{+\infty} h(k)\, x(n-k)$$





há 3 intervalos a considerar

$$y(n) = \begin{cases} 0 & n < 10 \\ \displaystyle\sum_{k=0}^{n-10} 4 \times \left(\frac{1}{3}\right)^k & 10 \le n \le 20 \\ \displaystyle\sum_{k=n-20}^{n-10} 4 \times \left(\frac{1}{3}\right)^k & n > 20 \end{cases}$$

os 2 últimos casos correspondem a progressões geométricas

$$= \begin{cases} 0 & n < 10 \\ 4 \cdot \dfrac{1-\left(\frac{1}{3}\right)^{n-9}}{1-\frac{1}{3}} & 10 \le n \le 20 \\ 4 \times \left(\frac{1}{3}\right)^{n-20} \dfrac{\left[1-\left(\frac{1}{3}\right)^{11}\right]}{1-\frac{1}{3}}, & n > 20 \end{cases}$$

$$= \begin{cases} 0, & n < 10 \\ 6\left[1-\left(\frac{1}{3}\right)^{n-9}\right], & 10 \le n \le 20 \\ 6\left(\frac{1}{3}\right)^{n-20}\left[1-\left(\frac{1}{3}\right)^{11}\right], & n > 20 \end{cases}$$