A 2.5

$$y[n] = (x * h)[n]$$

$$h[n] = (\delta * h)[n]$$

$$a[n] = (\sigma * h)[n]$$

(a)

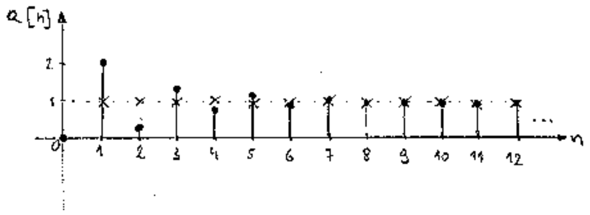
$$a[n] = \sum_{k=-\infty}^{\infty} 12\left\{\left(-\frac{1}{3}\right)^{k} - \left(-\frac{1}{2}\right)^{k}\right\}\sigma[k]\cdot\sigma[n-k] =$$

$$= 12\cdot\sigma[n]\sum_{k=0}^{n}\left(-\frac{1}{3}\right)^{k} - \left(-\frac{1}{2}\right)^{k} = 12\,\sigma[n]\left(\frac{1-\left(-\frac{1}{3}\right)^{n+1}}{1+\frac{1}{3}} - \frac{1-\left(-\frac{1}{2}\right)^{n+1}}{1+\frac{1}{2}}\right) =$$

$$= 12\,\sigma[n]\left\{\frac{3}{4}\left[1-\left(-\frac{1}{3}\right)^{n+1}\right] - \frac{2}{3}\left[1-\left(-\frac{1}{2}\right)^{n+1}\right]\right\} =$$

$$= \left\{\left(\frac{1}{3}\right)^{-2}\left[1-\left(-\frac{1}{3}\right)^{n+1}\right] - \left(\frac{1}{2}\right)^{-3}\left[1-\left(-\frac{1}{2}\right)^{n+1}\right]\right\}\sigma[n] =$$

$$= \left\{1-\left(-\frac{1}{3}\right)^{n-1} - \left(-\frac{1}{2}\right)^{n-2}\right\}\sigma[n]$$



(b) $\tilde{a}[n] = \sigma[n-n_0]$: $n_0 = 1$ (Überschwingen zum Zeitpunkt 1 vorhanden, neues System hat für $n=0$ $\tilde{a}[0]=0$)

$$\tilde{a}[n] = a\cdot\left\{1-\left(-\frac{1}{3}\right)^{n-1} - \left(-\frac{1}{2}\right)^{n-2}\right\}\sigma[n] + b\left\{1-\left(-\frac{1}{3}\right)^{n-2} - \left(-\frac{1}{2}\right)^{n-3}\right\}\sigma[n-1] + c\left\{1-\left(-\frac{1}{3}\right)^{n-3} - \left(-\frac{1}{2}\right)^{n-4}\right\}\sigma[n-2]$$

I: $\lim_{n\to\infty}\hat{a}[n] = 1$: $\Rightarrow$ $a+b+c=1$

II: $\tilde{a}[1] = 1$: $\Rightarrow$ $2a = 1$; $\underline{a = \frac{1}{2}}$

III: $\tilde{a}[2] = 1$: $\Rightarrow$ $\frac{1}{3}a + 2b = 1$; $\underline{b = \frac{5}{12}}$

$\underline{c = \frac{1}{12}}$

(c) $n_0 = 1$ (Grund: siehe Teil b)