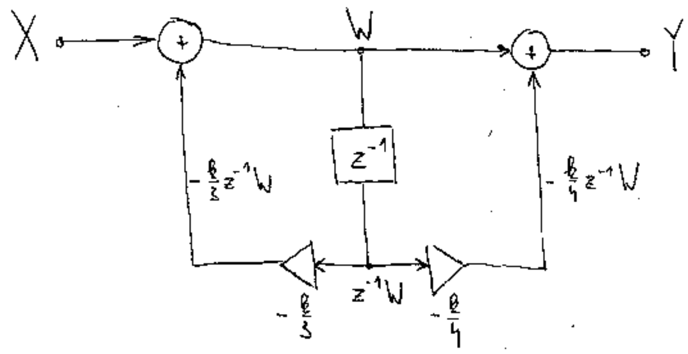
A 4.4

(a)

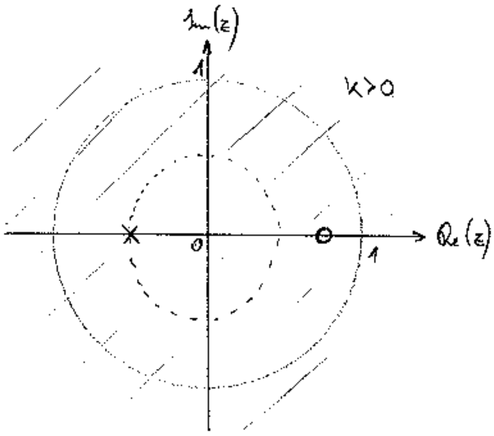


$$W = X - \frac{k}{3}z^{-1}W \qquad W = \left(1 + \frac{k}{3}z^{-1}\right)^{-1} \cdot X$$

$$Y = W - \frac{k}{4}z^{-1}W \qquad Y = W\left(1 - \frac{k}{4}z^{-1}\right)$$

$$\frac{Y}{X} = H = \frac{1 - \frac{k}{4}z^{-1}}{1 + \frac{k}{3}z^{-1}} = \frac{\frac{4z-k}{4z}}{\frac{3z+k}{3z}} = \frac{z - \frac{k}{4}}{z + \frac{k}{3}}$$

(b) NST: $z_0 = \frac{k}{4}$ POL: $z_\infty = -\frac{k}{3}$



stabiles Filter: Einheitskreis im Konvergenzkreis
rechtsseitige Impulsantwort (kausal) vorausgesetzt

$\left|-\frac{k}{3}\right| < 1 \Rightarrow |k| < 3$

(c) $$H(z) = \frac{z}{z+\frac{k}{3}} - \frac{k}{4}z^{-1}\frac{z}{z+\frac{k}{3}} \;\bullet\!\!-\!\!\circ\; \left(-\frac{k}{3}\right)^n \sigma[n] - \frac{k}{4}\left(-\frac{k}{3}\right)^{n-1}\sigma[n-1] = \left(-\frac{k}{3}\right)^n\sigma[n] + \frac{3}{4}\left(-\frac{k}{3}\right)^n \sigma[n-1] =$$

$$= -\frac{3}{4}\delta[n] + \frac{7}{4}\left(-\frac{k}{3}\right)^n \sigma[n] = h[n]$$

$$a[n] = (h * \sigma)[n] = -\frac{3}{4}\sigma[n] + \frac{7}{4}\sum_{k=0}^{n}\left(-\frac{k}{3}\right)^k \sigma[n] = \left(-\frac{3}{4} + \frac{7}{4}\frac{1-\left(-\frac{k}{3}\right)^{n+1}}{1+\frac{k}{3}}\right)\sigma[n] =$$

$$= \left\{-\frac{3}{4} + \frac{7}{4}\,\frac{3}{3+k} + \frac{7}{4}\frac{k}{3+k}\cdot\left(-\frac{k}{3}\right)^n\right\}\sigma[n]$$