Aufgabe: 2

$\Sigma\, 5$

(2.1)

$$H(p) = \frac{2 + \frac{4}{p} + \frac{2}{p^2}}{1 + \frac{4}{p} + \frac{5}{p^2}} = \frac{2p^2 + 4p + 2}{p^2 + 4p + 5}$$

2

$$\Rightarrow H(p) = 2 \cdot \frac{p^2 + 2p + 1}{p^2 + 4p + 5}$$

(2.2)

$$p_{N_{1/2}} = -1 \pm \sqrt{1 - 1} = -1$$

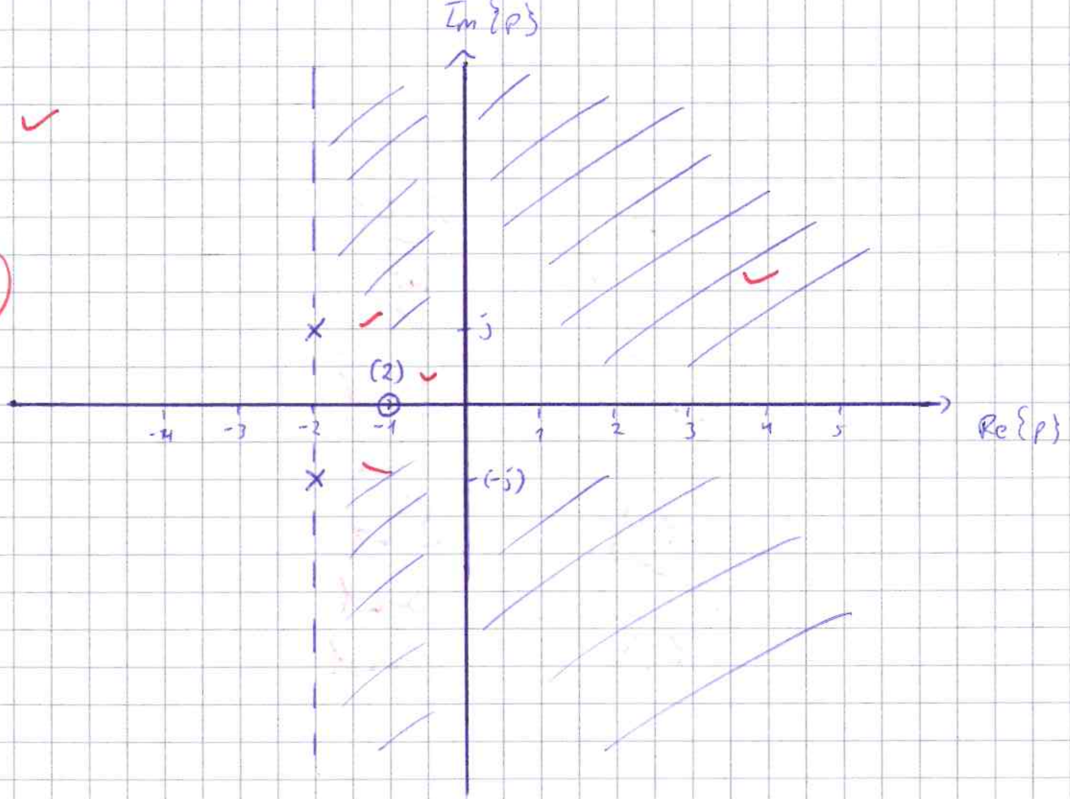
$$p_{N_1} = (-1) \qquad p_{N_2} = (-1)$$

$$p_{P_{1/2}} = -2 \pm \sqrt{4 - 5} = -2 \pm j$$

$$p_{P_1} = -2 + j \qquad p_{P_2} = -2 - j$$

$H_0 = 2$

2



(2.3) Ja, es ist stabil, da die Imaginär-Achse im Konvergenzbereich liegt

1

(2.4) Zunächst:

$$\begin{array}{l} p^2 + 2p - 5 : (p^2 - p - 2) = 1 + \dfrac{3p-3}{p^2-p-2} \\ -(p^2 - p - 2) \\ \hline 0 + 3p - 3 \end{array}$$

$$p_{1/2} = \frac{1}{2} \pm \sqrt{\frac{1}{4} + 2}$$

$$= \frac{1}{2} \pm \sqrt{\frac{9}{4}}$$

$$= \frac{1}{2} \pm \frac{3}{2}$$

$$\tilde{H}_1(p) := \frac{3p-3}{p^2-p-2}$$

$$\Rightarrow p^2 - p - 2 = (p-2)\cdot(p+1)$$

$$\Rightarrow \tilde{H}_1(p) = A_0 + \frac{B}{p-2} + \frac{C}{p+1} \quad \text{mit } A_0 = \lim_{p\to\infty} H(p) \to 0$$

$$\Rightarrow \tilde{H}_1(p) = \frac{B}{p-2} + \frac{C}{p+1} \quad \Leftrightarrow \quad Bp + B + Cp - 2C \overset{!}{=} 3p - 3$$

$$\Rightarrow B + C = 3$$

$$B - 2C = -3 \qquad B = -3 + 2C$$

$$\Rightarrow -3 + 2C + C = 3$$

$$-3 + 3C = 3 \quad \Rightarrow C = \frac{6}{3} = 2$$

$$\Rightarrow B = 1$$

$$\Rightarrow \tilde{H}_1(p) = \frac{1}{p-2} + \frac{C}{p+1}$$

Aufgabe: 2

Daraus folgt für $H_1(p)$:

$$H_1(p) = 1 + \frac{1}{p-2} + \frac{2}{p+1}$$

$$\updownarrow \mathcal{L}$$

$$h(t) = \delta(t) - e^{2t}\varepsilon(-t) + \cancel{2\cdot e^{-t}\varepsilon(t)} \quad 2\cdot e^{-t}\varepsilon(t)$$

3

$$\cancel{\Rightarrow h(t) = \delta(t) - e^{2t}\varepsilon(-t) + 2\cdot e^{-t}\varepsilon(t)}$$

$$\Rightarrow h(t) = \delta(t) - e^{2t}\varepsilon(-t) + 2\cdot e^{-t}\varepsilon(t)$$

(2.5) $$\cancel{H_1(p) = \frac{(p-2)(p+1) + (p+1) + 2(p-2)}{(p-2)(p+1)}}$$

$$\cancel{H_3(p) = H_1(p)\cdot H_2(p) = \frac{p+1}{p-2}}$$

$$\cancel{\Rightarrow H_2(p) = \frac{p+1}{\ldots}} \qquad \cancel{\Rightarrow H_2(p) = \frac{p+1}{p+1\left((p-2)+1-\frac{4}{p+1}\right)}}$$

$$\cancel{\Rightarrow H_2(p) = \frac{1}{(p-2)+1-\frac{4}{p+1}}}$$