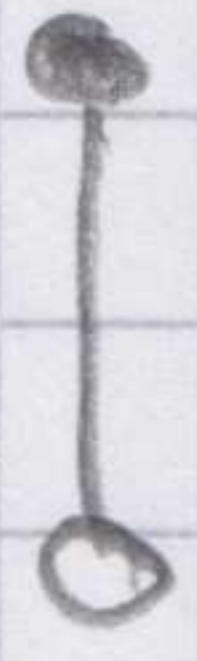


II.3.6

$$H(p) = \frac{\omega_0^2}{p^2 + 2\xi\omega_0 p + \omega_0^2}$$



$$h(t) \rightarrow h_\sigma(t) = \int_0^t h(z) dz$$



Integrationsatz

$$\frac{1}{p} H(p)$$

$$\frac{1}{p} H(p) = \frac{1}{p} \cdot \frac{\omega_0^2}{p^2 + 2\xi\omega_0 p + \omega_0^2} = \frac{A}{p} + \frac{Bp + C}{p^2 + 2\xi\omega_0 p + \omega_0^2}$$

Such möglich: Polstellen berechnen und dann in zwei Partialbrüche zerlegen (aufwändiger!)

Partialbruchzerlegung

$$\omega_0^2 = Ap^2 + 2\xi\omega_0 p + \omega_0^2 + Bp^2 + Cp$$

$$p^2: 0 = A + B$$

$$p^1: 0 = 2\xi\omega_0 + C$$

$$p^0: \omega_0^2 = A\omega_0^2$$

→ Koeffizientenvergleich:

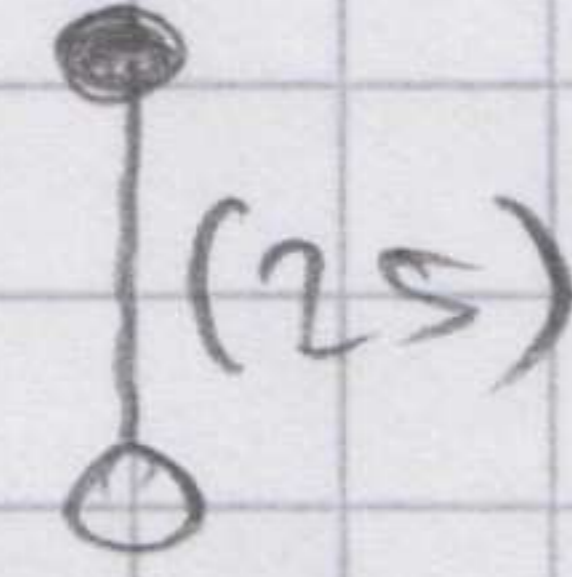
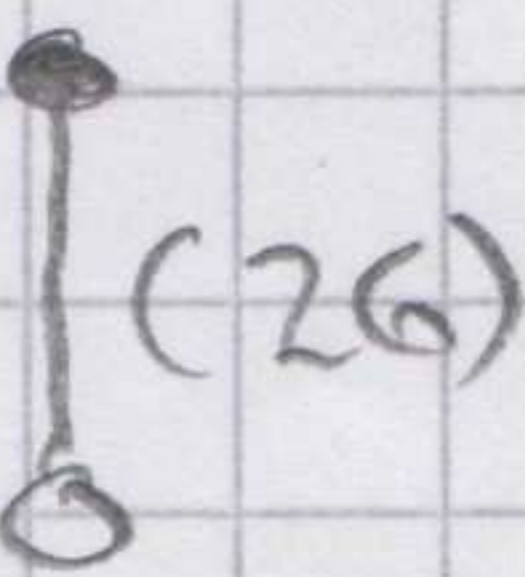
$$B = -A = -1$$

$$C = -2\xi\omega_0$$

$$A = 1$$

$$\frac{1}{p} H(p) = \frac{1}{p} - \frac{p}{p^2 + 2\xi\omega_0 p + \omega_0^2} - \frac{2\xi\omega_0}{p^2 + 2\xi\omega_0 p + \omega_0^2}$$

$\xi < 1!$



$$\sim \frac{1}{\sqrt{D}} e^{-\frac{1}{2}\alpha_1 t} \left(-\frac{\alpha}{2} \sin(\sqrt{-D}t) + \sqrt{-D} \cos(\sqrt{-D}t) \right) - 2\xi\omega_0 \frac{1}{\sqrt{-D}} e^{-\frac{1}{2}\alpha_1 t} \sin(\sqrt{-D}t)$$

(26)

(25)

$$a_1 = 2 \xi \omega_0 \quad a_0 = \omega_0^2$$

$$D = \frac{1}{4} a_1^2 - a_0 = \xi^2 \omega_0^2 - \omega_0^2 = (\xi^2 - 1) \omega_0^2$$

$$\sqrt{-D} = \sqrt{1 - \xi^2} \omega_0$$

$$\Rightarrow h_0(t) = 1 - \frac{1}{\sqrt{-D}} e^{-\frac{1}{2} a_1 t} \left[\left(-\frac{a_1}{2} + 2 \xi \omega_0 \right) \sin(\sqrt{-D} t) + \sqrt{-D} \cos(\sqrt{-D} t) \right]$$

$$\Rightarrow h_0(t) = 1 - \left[\frac{-\xi \omega_0 + 2 \xi \omega_0}{\sqrt{1 - \xi^2} \omega_0} \sin(\sqrt{1 - \xi^2} \omega_0 t) + \cos(\sqrt{1 - \xi^2} \omega_0 t) \right] e^{-\xi \omega_0 t}$$

$$= 1 - \left[\frac{\xi}{\sqrt{1 - \xi^2}} \sin(\sqrt{1 - \xi^2} \omega_0 t) + \cos(\sqrt{1 - \xi^2} \omega_0 t) \right] e^{-\xi \omega_0 t}$$