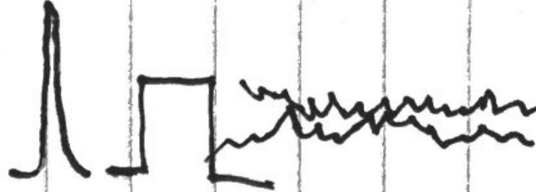
$$\ddot{x} + 2\varkappa\dot{x} + \omega_0^2 x = f\cos\Omega t$$

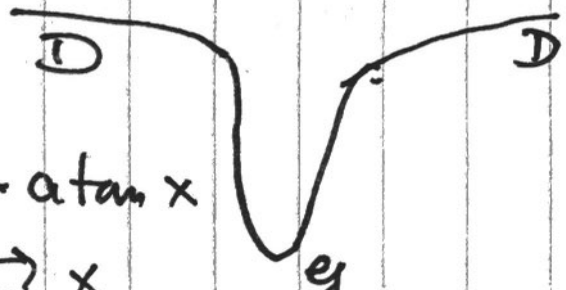


Ansatz: $x(t) = A\, e^{i(\Omega t - \Phi)}$, $A \in \mathbb{R}$

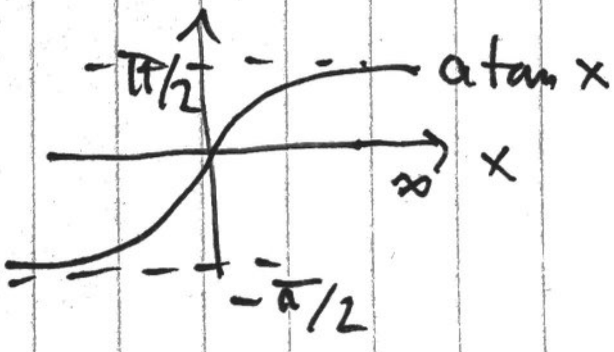
erfüllt die DGL (s. Budo) wenn

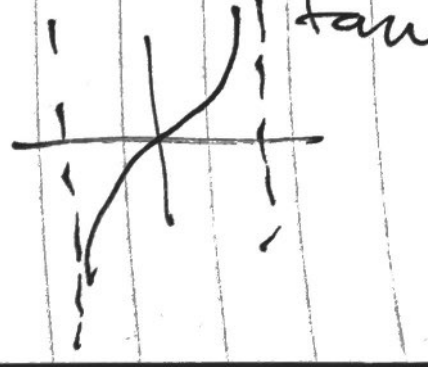
$$A = \frac{f}{\left[(\omega_0^2 - \Omega^2)^2 + \underbrace{4\varkappa^2\Omega^2}_{\text{klein}}\right]^{1/2}}$$

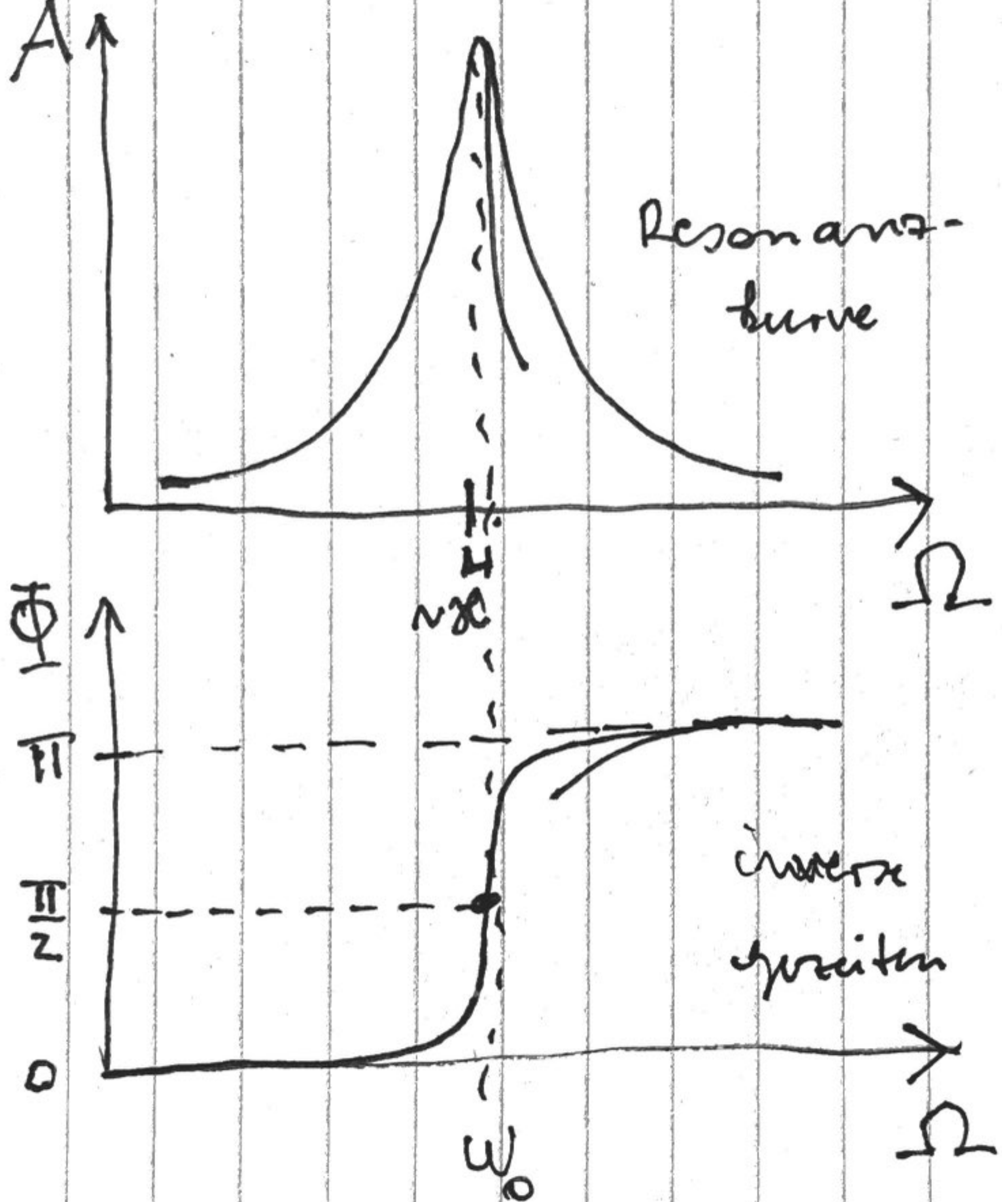
Doppler-Resonanz

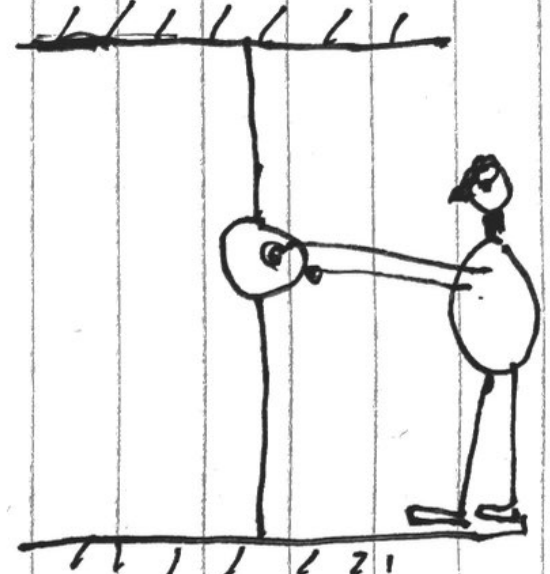


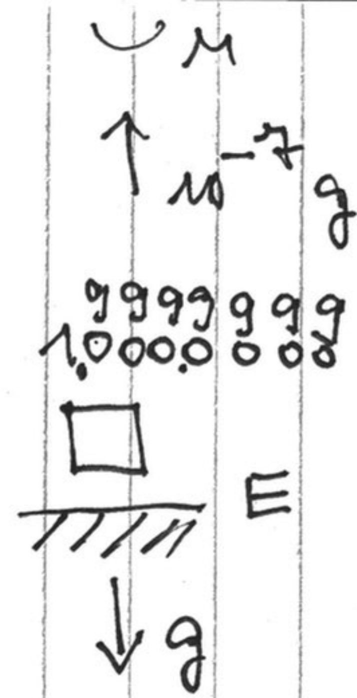
$$\Phi = \operatorname{atan}\frac{2\varkappa\Omega}{\omega_0^2 - \Omega^2}$$

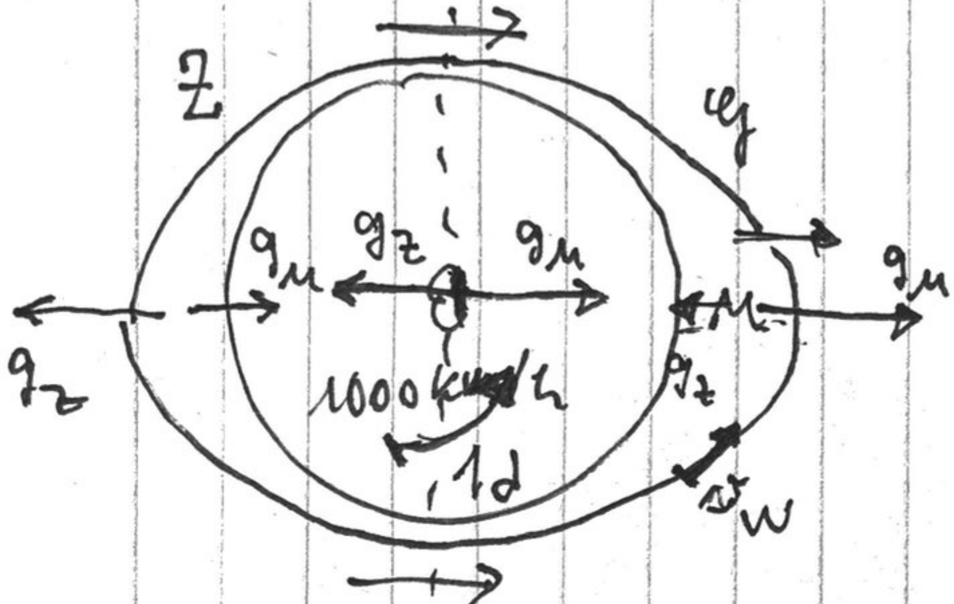


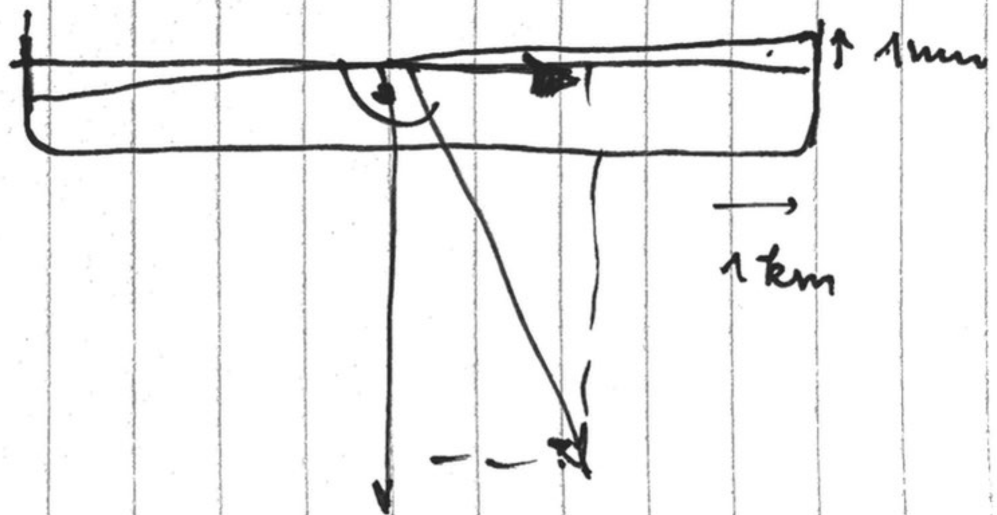



A
Resonanz-
kurve
Ω
Φ
π
π/2
0
Ω
ω0





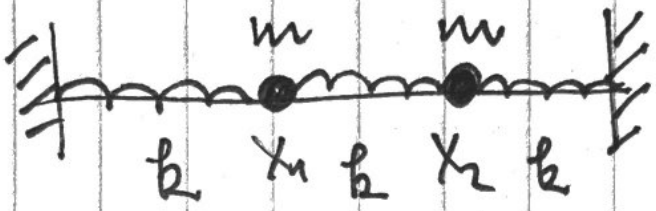




$$v_W = \sqrt{gh}$$

~ 700 km/h

gekoppelte Oszillatoren



$$m\ddot{x}_1 = -kx_1 + k(x_2 - x_1)$$

$$m\ddot{x}_2 = -kx_2 \cancel{+} - k(x_2 - x_1)$$

addiere & subtrahiere

$$+)\quad m\,\ddot{\overline{x_1 + x_2}} = -k(x_1 + x_2) \rightarrow m\ddot{y}_1 = -k\,y_1$$

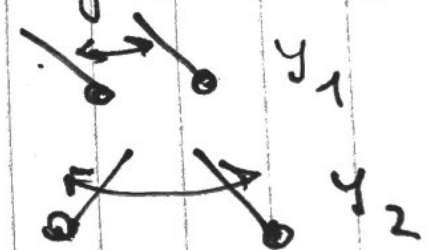
hat Lsg $a\cos(\omega t + \varphi)$

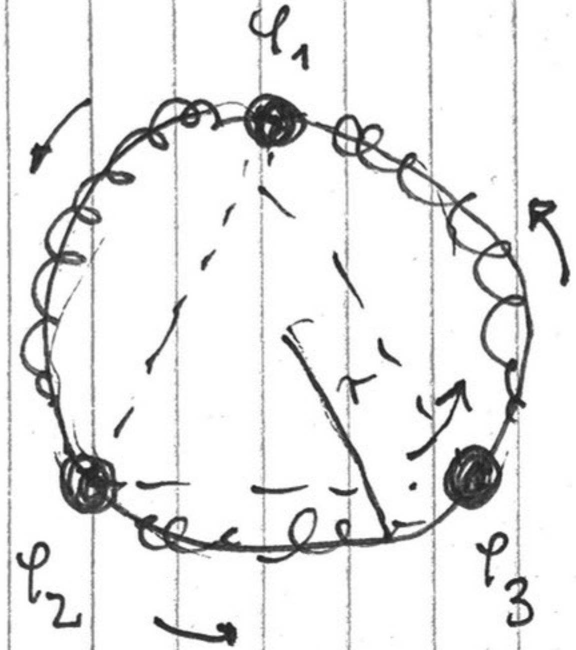
$$-)\quad m\,\ddot{\overline{x_1 - x_2}} = -3k(x_1 - x_2) \rightarrow m\ddot{y}_2 = -3k\,y_2$$

$$x_1 + x_2 = y_1 = \overset{\text{Amplitude}}{a_1} \cos\left(\sqrt{\frac{k}{m}}\,t + \varphi_1\right)$$

$$x_1 - x_2 = y_2 = a_2 \cos\left(\sqrt{\frac{3k}{m}}\,t + \varphi_2\right)$$

Eigenmode





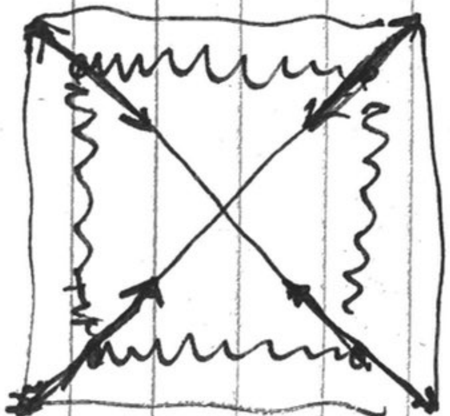
3 Glg f. [illegible] $\varphi_1, \varphi_2, \varphi_3$

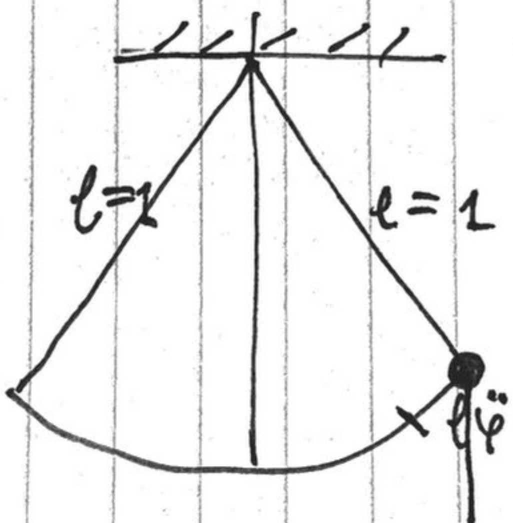
[illegible]

$$\ddot{\varphi}_1 = (\varphi_2 - \varphi_1) \;\cdot\cdot\; (\varphi_1 - \varphi_3)$$

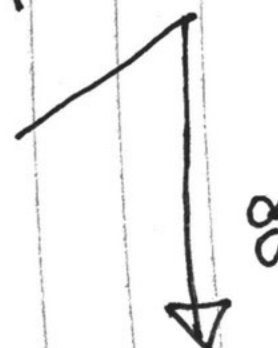
$$\ddot{\varphi}_2 = (\varphi_3 - \varphi_2) \;\cdot\cdot\; (\varphi_2 - \varphi_1)$$

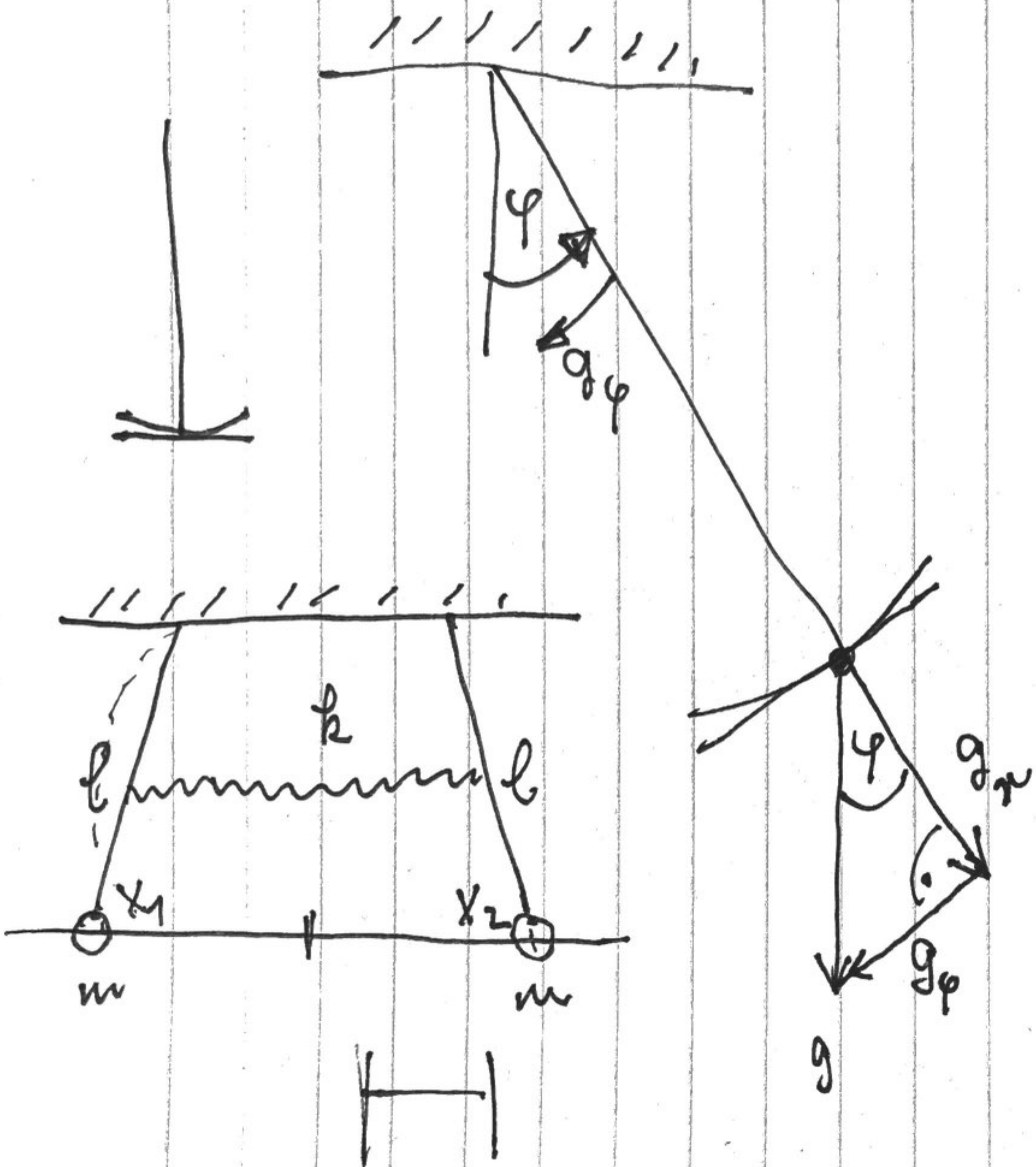
$$\ddot{\varphi}_3 = (\varphi_1 - \varphi_3) \;\cdot\cdot\; (\varphi_3 - \varphi_2)$$





$$l\,\ddot{\varphi} \overset{!}{=} g_\varphi$$





$$l\ddot{\varphi} = -g_\varphi$$

$$l\ddot{\varphi} = -g\sin\varphi$$

$$\approx -g\varphi$$

$$\ddot{\varphi} = -\frac{g}{l}\varphi \;:\; \varphi = A\cos\left(\sqrt{\frac{g}{l}}\,t+\varphi_0\right)$$

NR

$$\sin\varphi = \frac{g_\varphi}{g}$$

$$\sqrt{\frac{k}{m}} \qquad \sqrt{\frac{g}{l}}$$

Feder Faden