

$$T(t) = C e^{rt} + T_0$$

193. Gekoppelte physikalische Pendel

$$m = 5 \text{ kg}; \quad k = 2 \text{ N/m}; \quad a = 0.1 \text{ m}; \quad h = 0.4 \text{ m}; \quad l = 0.1 \text{ m}$$

a) $\omega = \sqrt{\frac{mgl}{I}}$

$$I = \frac{1}{12} m(a^2 + h^2) + ml^2 = 0.12 \text{ kg m}^2$$

$$\omega_a = \sqrt{\frac{mgl}{I}} = \underline{\underline{6.37 \text{ rad/s}}}$$

b) $F = -m\omega^2 x; \quad \Delta x = x_1 - x_2$

$$m\ddot{x}_1 = -m\omega_a^2 x_1 - k(x_1 - x_2)$$

$$m\ddot{x}_2 = -m\omega_a^2 x_2 - k(x_2 - x_1)$$

$$\Rightarrow m(\ddot{x}_1 - \ddot{x}_2) = -m\omega_a^2(x_1 - x_2) - 2k(x_1 - x_2) = -(m\omega_a^2 + 2k)(x_1 - x_2)$$

$$\Delta\ddot{x} = -\underbrace{(\omega_a^2 + \frac{2k}{m})}_{= \omega_b} \Delta x$$

$$\omega_b = \sqrt{\omega_a^2 + \frac{2k}{m}} = \underline{\underline{6.43 \text{ rad/s}}}$$

c) $\delta\omega = \omega_b - \omega_a$

$$0 = \cos\left(\frac{1}{2}\delta\omega t\right)$$

$$t = \frac{2 \arccos(0)}{\delta\omega} = \underline{\underline{50.29 \text{ s}}}$$

color

HTML

yellow!75!black BFBF00

yellow!50!black 808000

yellow!5!white FFFFF2