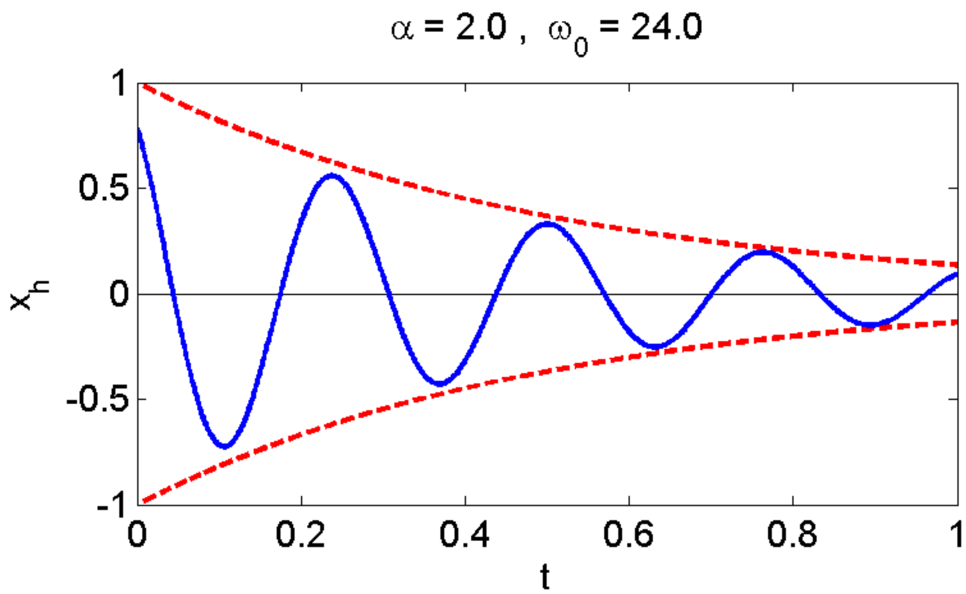
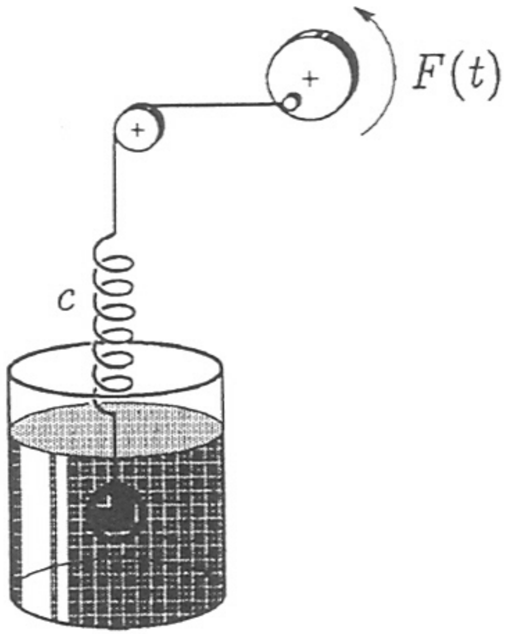
Bemerkung 3.9b: Lineare Schwingungen

Aufgabenstellung

$$\ddot{x}(t) + 2\alpha\dot{x}(t) + \omega_0^2 x(t) = 0$$

Periodischer Fall ($\alpha^2 - \omega_0^2 < 0$): $x_h(t) = C\mathrm{e}^{-\alpha t}\cos(\omega_1 t - \delta)$





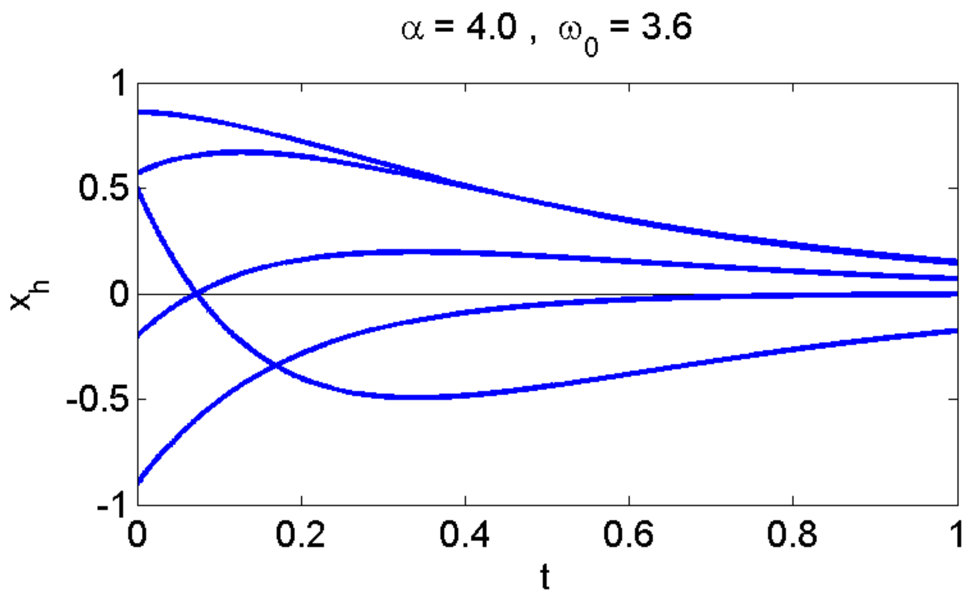
Bemerkung 3.9b: Lineare Schwingungen (II)

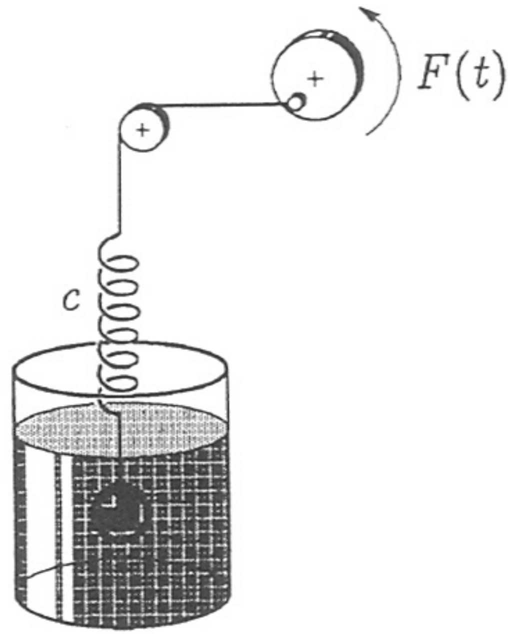
Aufgabenstellung

$$\ddot{x}(t) + 2\alpha\dot{x}(t) + \omega_0^2 x(t) = 0$$

$$\beta := \sqrt{\alpha^2 - \omega_0^2}$$

Aperiodischer Fall ($\alpha^2 - \omega_0^2 > 0$): $x_h(t) = c_1 e^{(-\alpha+\beta)t} + c_2 e^{(-\alpha-\beta)t}$



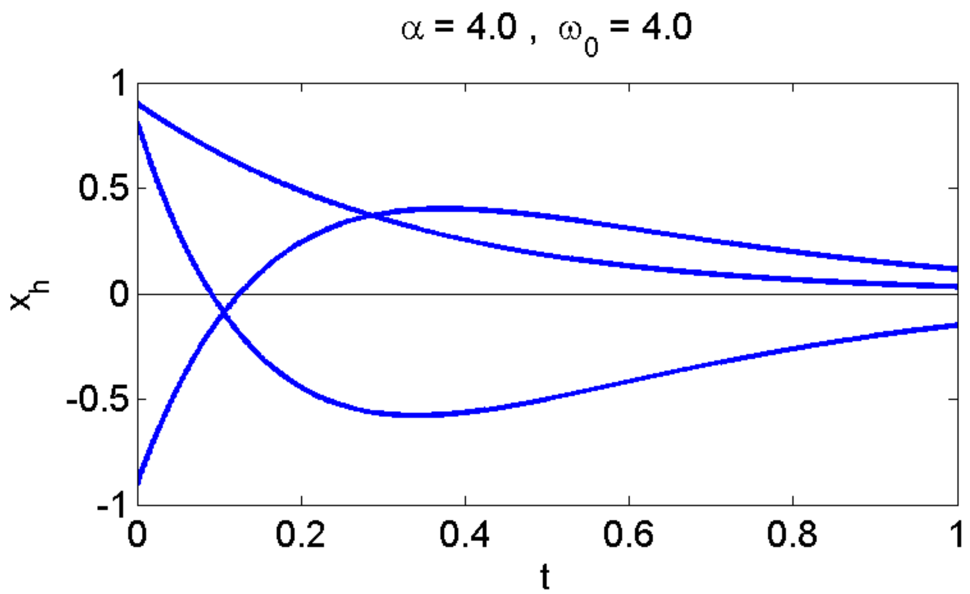


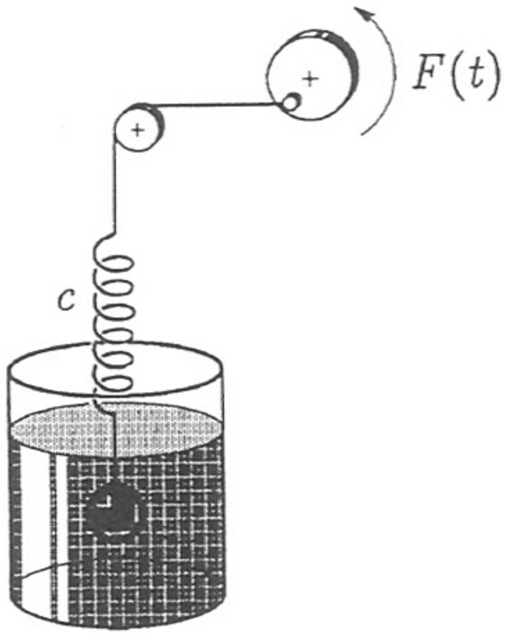
Bemerkung 3.9b: Lineare Schwingungen (III)

Aufgabenstellung

$$\ddot{x}(t) + 2\alpha\dot{x}(t) + \omega_0^2 x(t) = 0$$

Aperiodischer Grenzfall ($\alpha^2 = \omega_0^2$): $x_h(t) = (c_1 + c_2 t)\,\mathrm{e}^{-\alpha t}$





Bemerkung 3.9b: Lineare Schwingungen (IV)

Aufgabenstellung

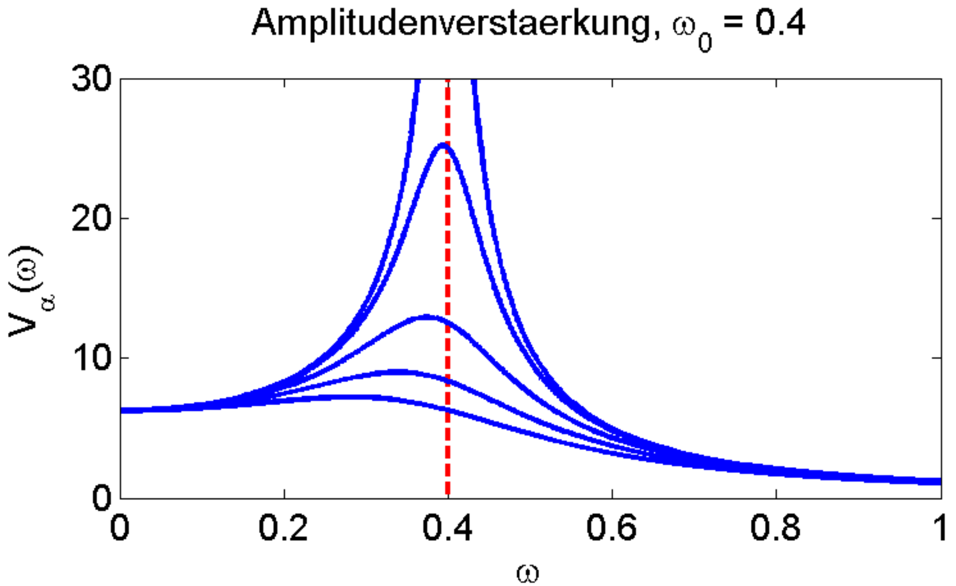
$$\ddot{x}(t) + 2\alpha\dot{x}(t) + \omega_0^2 x(t) = A\cos\omega t$$

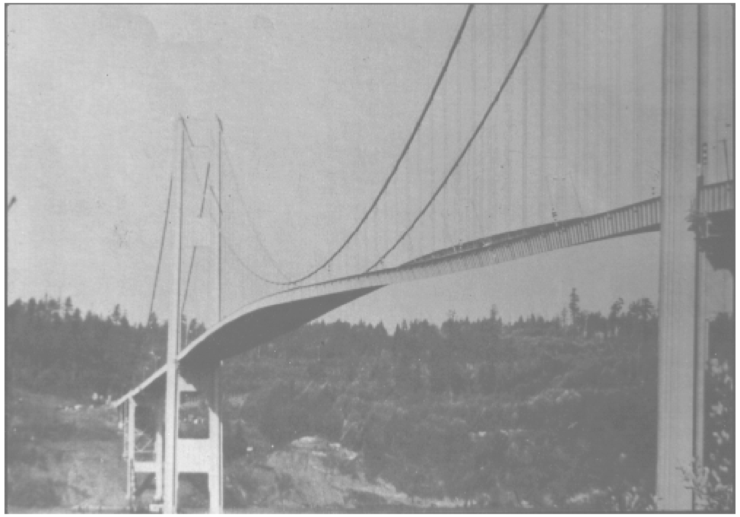
Partikuläre Lösung

$$x_0(t) = \frac{A}{\sqrt{(\omega_0^2-\omega^2)^2 + 4\alpha^2\omega^2}}\cos(\omega t - \varphi), \quad \varphi = \arctan\frac{2\alpha\omega}{\omega_0^2-\omega^2}$$

Amplitudenverstärkung

$$V_\alpha(\omega) = \frac{1}{\sqrt{(\omega_0^2-\omega^2)^2 + 4\alpha^2\omega^2}}$$





http://www.cornelsen.de/physikextra/htdocs/Resonanz.html