Differentialgleichungen

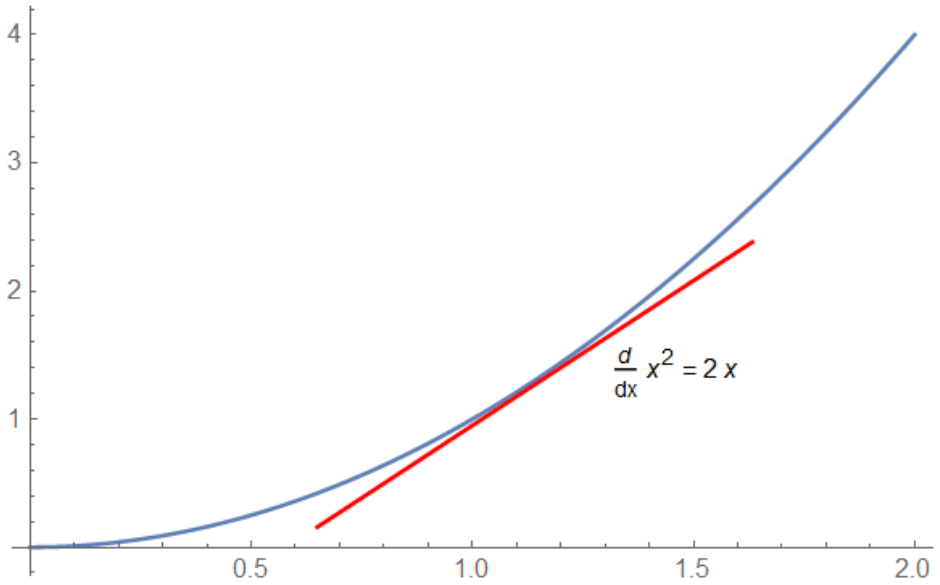
? ~~Federpenal~~ und Planetenbahnen

Federpendel

Differential & Integral

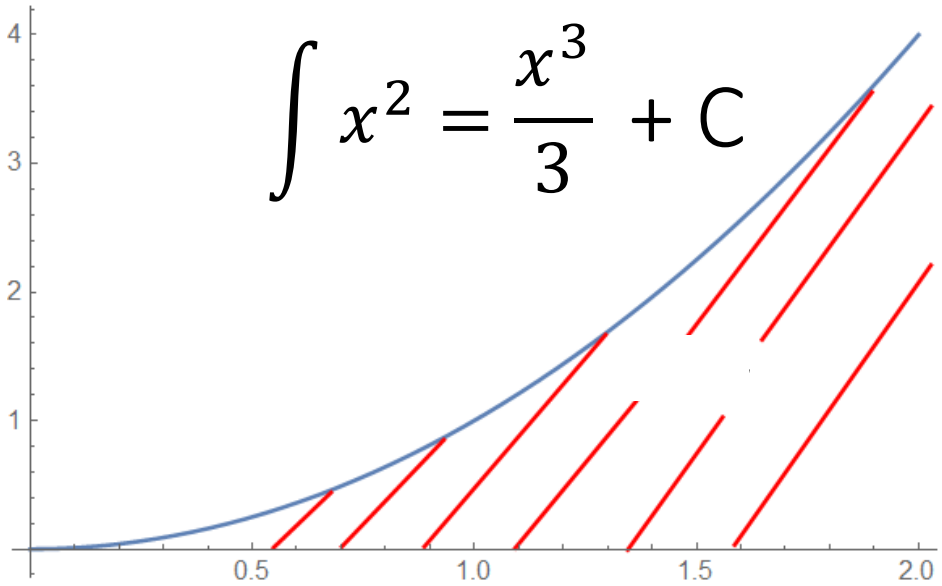
Differential

f‘(x) … Anstieg der Funktion an Punkt x



Differential & Integral

$$\int Aspiri\ dn = Aspiri \cdot n + C$$

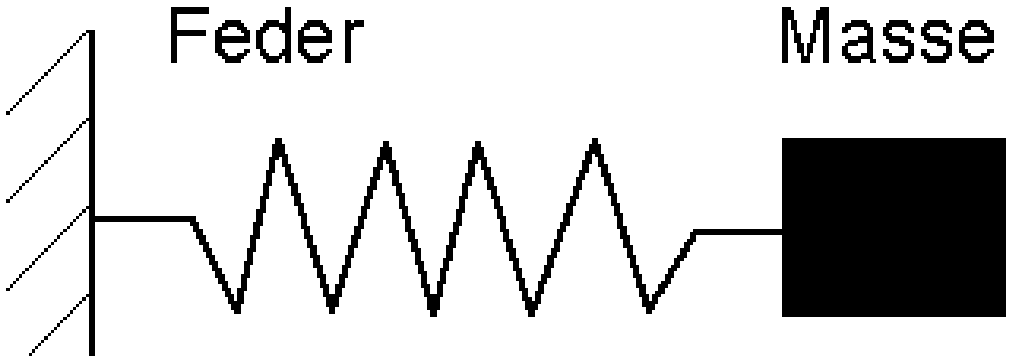


Projekte - Gedämpfte Schwingung

$$f'' + 2\gamma * f' + \omega^2 * f = 0$$

Ansatz:

$$f(x) = c * e^{\lambda x}$$



$$\lambda^2 + 2\gamma * \lambda + \omega^2 = 0$$

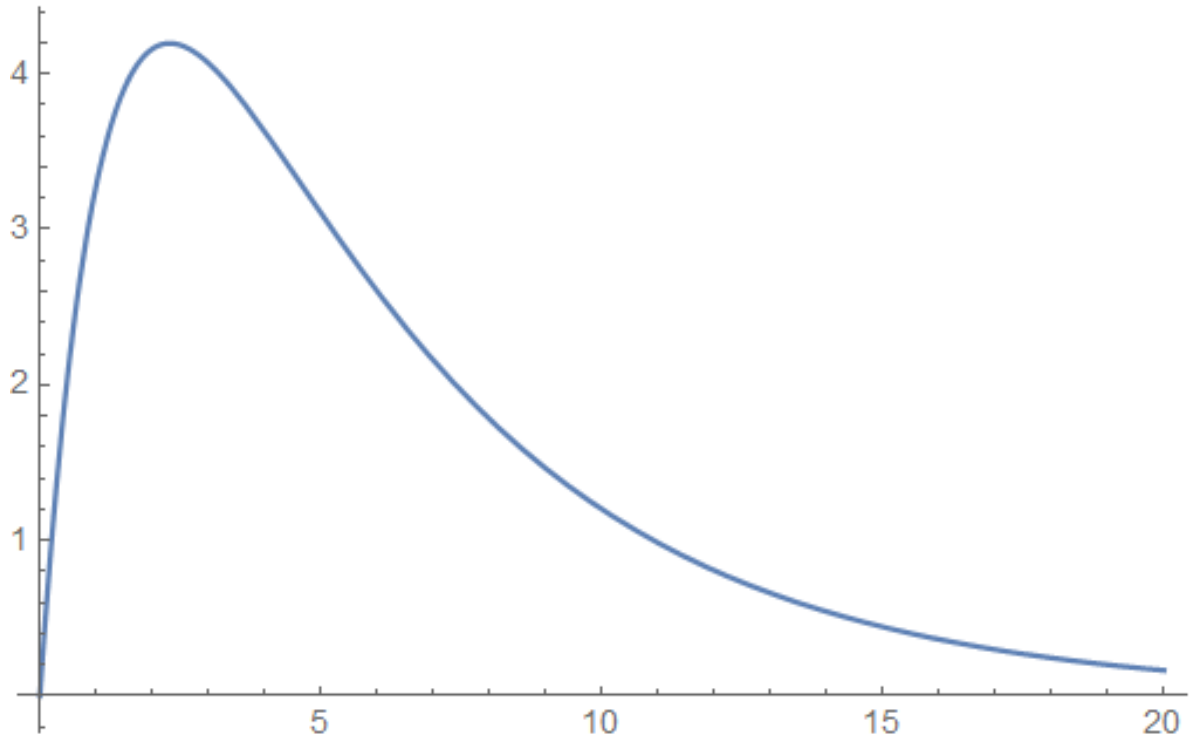
$$\lambda = -\gamma \pm \sqrt{\gamma^2 - \omega^2}$$

$$f(x) = -\frac{v0}{2 * \sqrt{\gamma^2 - \omega^2}} * e^{x*\left(-\gamma - \sqrt{\gamma^2 - \omega^2}\right)} + \frac{v0}{2 * \sqrt{\gamma^2 - \omega^2}} * e^{x*\left(-\gamma + \sqrt{\gamma^2 - \omega^2}\right)}$$

Projekte - Gedämpfte Schwingung

Fall 1: Federkonstante < Widerstand

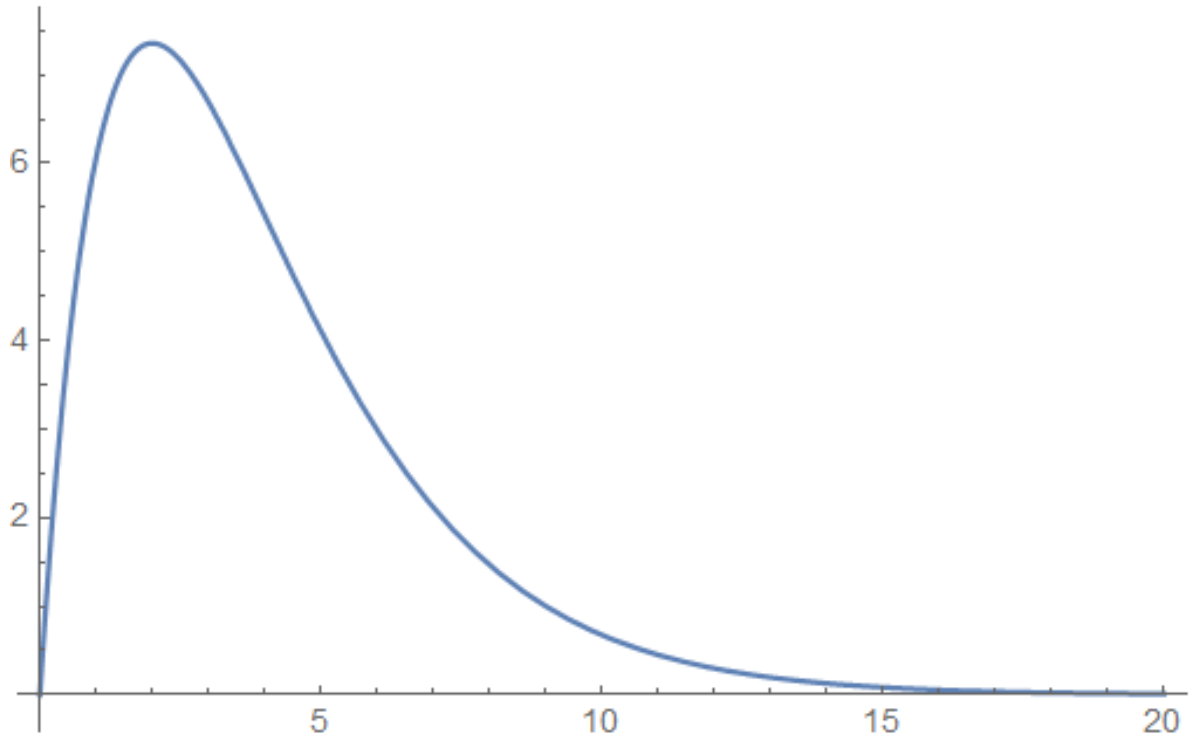
$\omega < \gamma$:



Projekte - Gedämpfte Schwingung

Fall 2: Widerstand = Federstärke

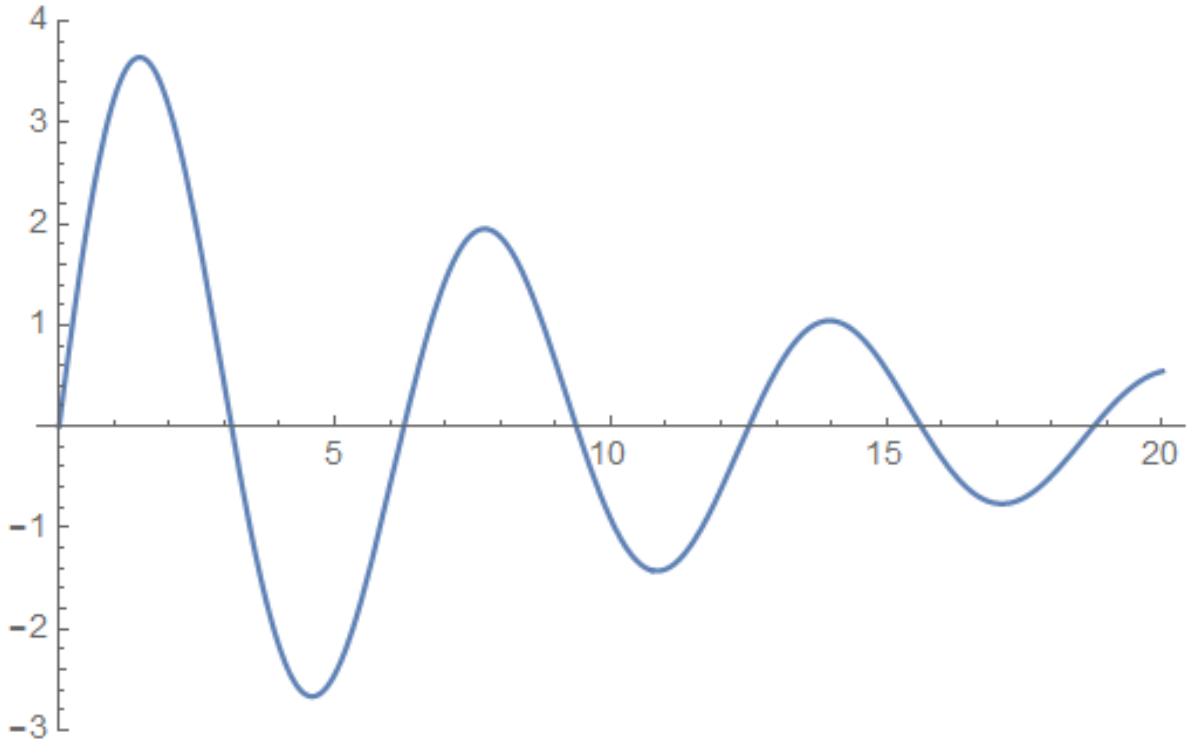
$\omega = \gamma$:



Projekte - Gedämpfte Schwingung

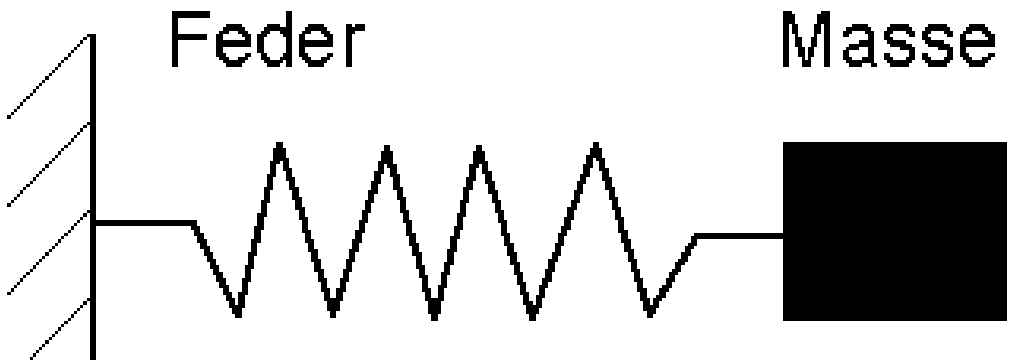
Fall 3: Widerstand < Federkonstante

$\gamma < \omega$:



Projekte – GAS Problem

$$f''(t) + 2\gamma * f'(t) + \frac{k}{M} * f(t) = K * \mathrm{Sin}(\omega * t)$$



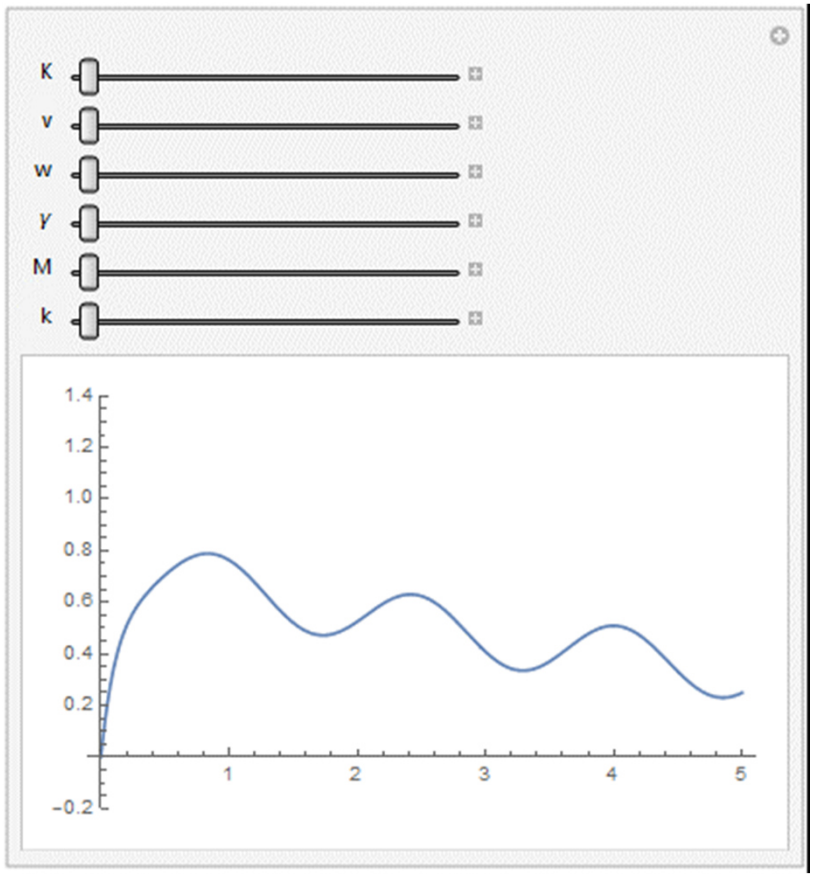
$$f(0) = 0$$

$$f'(0) = v$$

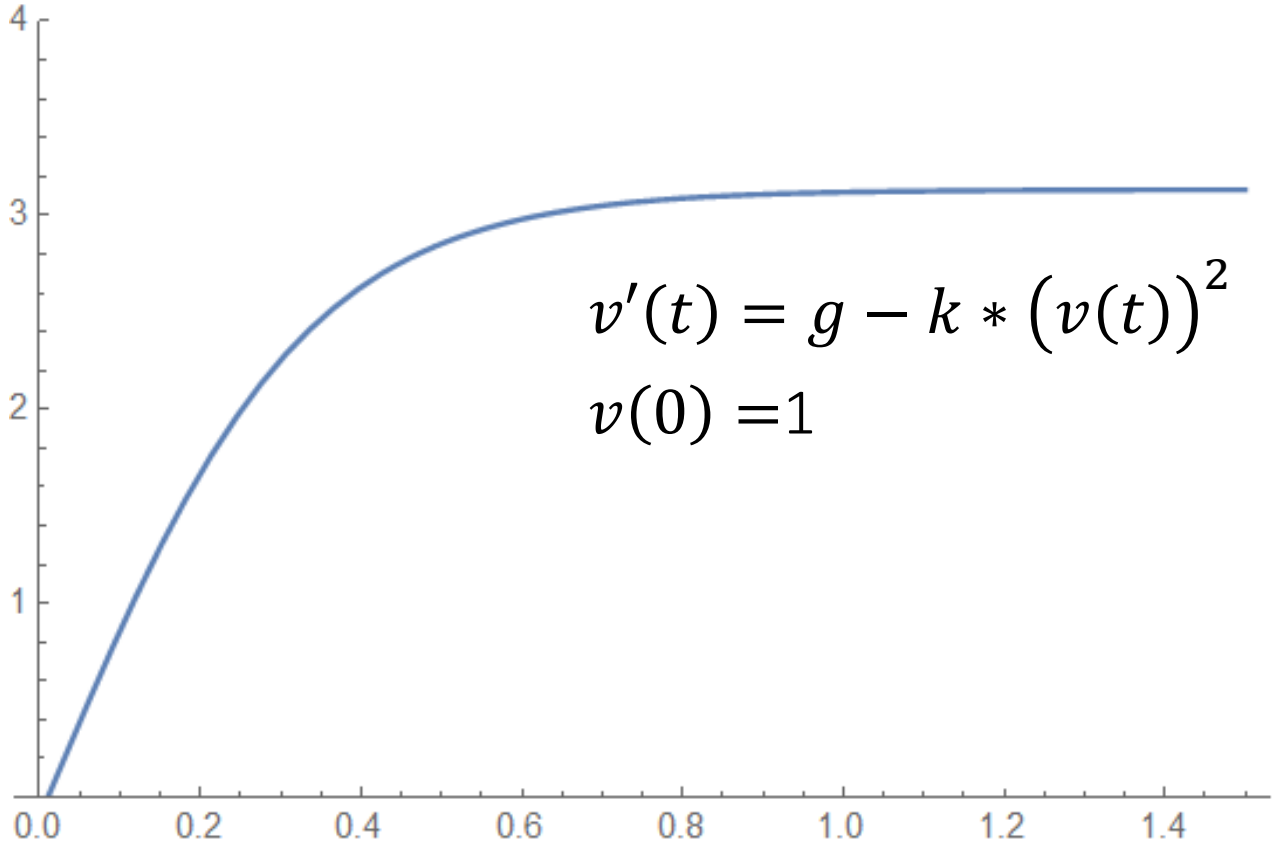
Projekte – GAS Lösung

$$\text{Kathi}(t)=\frac{1}{2\sqrt{-\frac{k}{M}+\gamma^2}}\left(\begin{array}{c}\frac{e^{-t\left(\gamma+\sqrt{-\frac{k}{M}+\gamma^2}\right)}\left(-kv+KMw+Mv\left(w^2+2\gamma\left(\gamma+\sqrt{-\frac{k}{M}+\gamma^2}\right)\right)\right)}{k-M\left(w^2+2\gamma\left(\gamma+\sqrt{-\frac{k}{M}+\gamma^2}\right)\right)}+\\ \frac{e^{t\left(-\gamma+\sqrt{-\frac{k}{M}+\gamma^2}\right)}\left(kv-M\left(Kw+v\left(w^2+2\gamma^2-2\gamma\sqrt{-\frac{k}{M}+\gamma^2}\right)\right)\right)}{k+M\left(-w^2-2\gamma^2+2\gamma\sqrt{-\frac{k}{M}+\gamma^2}\right)}-\\ \frac{KM\left(w\text{Cos}[tw]+\left(-\gamma+\sqrt{-\frac{k}{M}+\gamma^2}\right)\text{Sin}[tw]\right)}{-k+M\left(w^2+2\gamma^2-2\gamma\sqrt{-\frac{k}{M}+\gamma^2}\right)}+\frac{KM\left(-w\text{Cos}[tw]+\left(\gamma+\sqrt{-\frac{k}{M}+\gamma^2}\right)\text{Sin}[tw]\right)}{k-M\left(w^2+2\gamma\left(\gamma+\sqrt{-\frac{k}{M}+\gamma^2}\right)\right)}\end{array}\right)$$

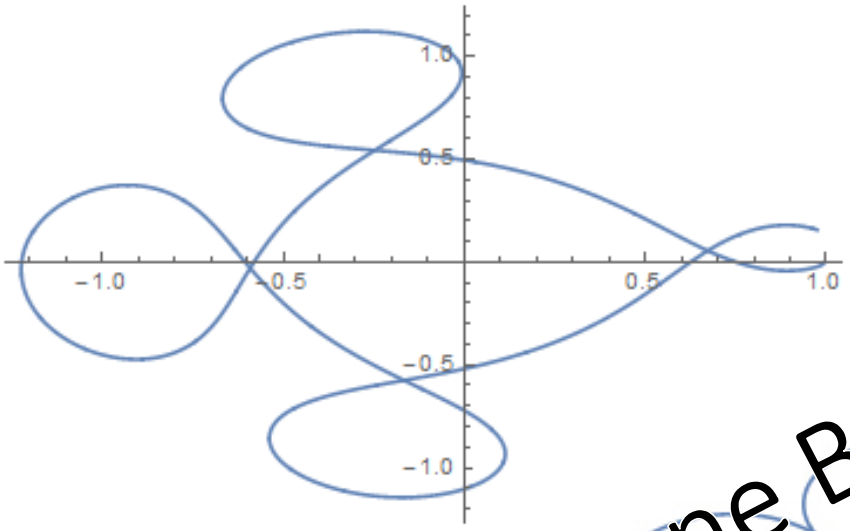
Projekte – GAS Anime

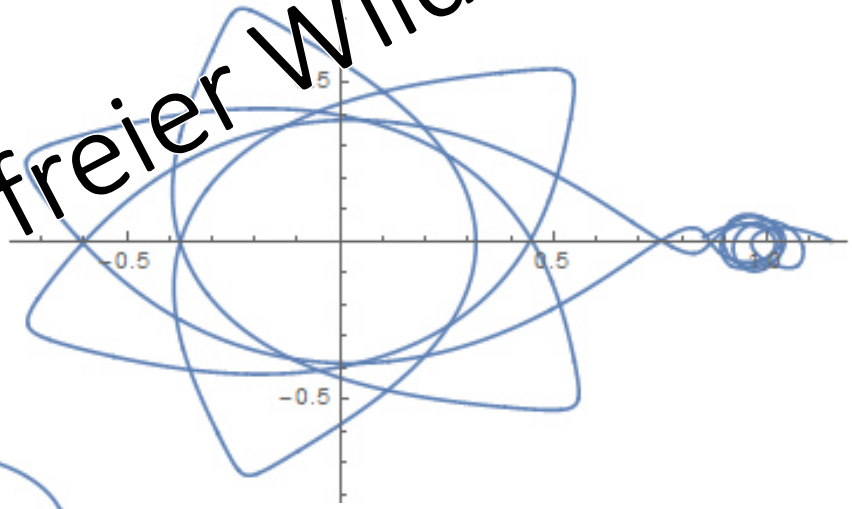


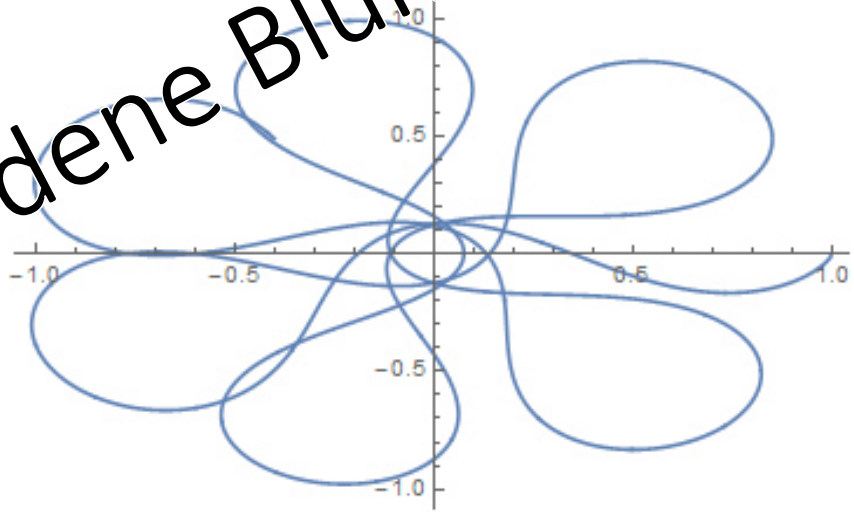
Projekte – Freier Fall



Projekte – Planetenbahnen







Verschiedene Blumen in freier Wildbahn