

Differentialgleichung in Standardform

$$\ddot{x} + \omega^2 x = 0 \quad \Rightarrow \quad \ddot{x} = -\omega^2 x$$

$$y = \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = \begin{pmatrix} \dot{x} \\ x \end{pmatrix} \quad \Rightarrow \quad \dot{y} = \begin{pmatrix} \dot{\dot{x}} \\ \dot{x} \end{pmatrix} = \underbrace{\begin{pmatrix} y_2 \\ -\omega^2 y_1 \end{pmatrix}}_{f(t, y)}$$

RK32-Schritt

$$k_1 = f(t, y)$$

$$k_2 = f\left(t + \frac{h}{2}, y + \frac{h}{2}k_1\right)$$

$$k_3 = f\left(t + \frac{3h}{4}, y + \frac{3h}{4}k_2\right)$$

$$k = \frac{1}{9}(2k_1 + 3k_2 + 4k_3)$$

$$y(t+h) = y + hk$$

$$k_4 = f(t+h, y(t+h))$$

$$\varepsilon = \frac{h}{72} |-5k_1 + 6k_2 + 8k_3 - 5k_4|$$