

1D-, 2D- ODE examples in 3D-XplorMath*

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1D 1st Order:

logistic: $\dot{x} = aa \cdot x(1 - x/bb)$

mass action: $\dot{x} = aa \cdot x + bb \cdot x^2$

1D 2nd Order:

harmonic Osc: $\ddot{x} = -aa^2 x - bb u$

forced Osc: $\ddot{x} = -aa^2 x - bb u + cc \cos(dd(t - ee))$

forced Duffing: $\ddot{x} = -hh x - ii x^3 - aa u + bb \cos(cc t)$

van der Pol: $\ddot{x} = hh x - aa(x^2 - 1)u + bb \cos(cc t)$

Pendulum: $\ddot{x} = -aa \sin(x) - bb u$

2D 1st Order:

harmonic Osc: $\begin{pmatrix} x \\ y \end{pmatrix} \cdot = \begin{pmatrix} 0 & 1 \\ -aa & -bb \end{pmatrix} \cdot \begin{pmatrix} x \\ y \end{pmatrix}$

Pendulum: $\begin{pmatrix} x \\ y \end{pmatrix} \cdot = \begin{pmatrix} y \\ -aa \sin(x) - bb y \end{pmatrix}$

linear 2D: $\begin{pmatrix} x \\ y \end{pmatrix} \cdot = \begin{pmatrix} aa & bb \\ cc & dd \end{pmatrix} \cdot \begin{pmatrix} x \\ y \end{pmatrix}$

VolterraLotka: $\begin{pmatrix} x \\ y \end{pmatrix} \cdot = \begin{pmatrix} (aa - bb y) \cdot x \\ (cc x - dd) \cdot y \end{pmatrix}$

2D 2nd Order: $(\dot{x} = u, \dot{y} = v)$

coupled Osc: $\begin{pmatrix} x \\ y \end{pmatrix} \cdot\cdot = \begin{pmatrix} -aa^2 x + dd(y - x) - gg u \\ -bb^2 y + dd(x - y) - hh v \end{pmatrix}$

forced Osc: $\begin{pmatrix} x \\ y \end{pmatrix} \cdot\cdot = \begin{pmatrix} -aa^2 x + bb \cos(cc t) \\ -dd^2 y + ee \cos(ee t) \end{pmatrix}$

Foucault Pend: $\begin{pmatrix} x \\ y \end{pmatrix} \cdot\cdot = \begin{pmatrix} -aa^2 x + 2 bb \sin(\pi cc/180)v \\ -aa^2 y - 2 bb \sin(\pi cc/180)u \end{pmatrix}$

bb := earth' angular velocity, cc := pendulum latitude

* This file is from the 3D-XplorMath project. Please see: