

Differential Equations

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Spring 2016

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1 Background

Coupled systems are those defined as requiring being solved together, such as

$$R' = aR + bJ, J' = cR + bJ,$$

rather than equations containing only their own function, which would be uncoupled.

Linear differential equations are defined as equations with constants as the multiplier of each function derivative.

First order differential equations means that the highest derivative in the equation is the first derivative, and is extended as such.

For some identically restricted functions,

$$R' = aR + bJ, J' = bR + aJ,$$

where $R(0) = R_0$ and $J(0) = J_0$, where $a < 0, b > 0$, if $|a| > |b|$, we can graph the phase plane of R on the x-axis, J on the y-axis, such that for all possible functions, it moves toward the stable node $(0, 0)$. These stable nodes don't need to be a point, but rather can be a curve of some sort.