Definitions

Ordinary Differential Equation	Contains derivatives of one or more functions with respect to one variable
Classification by Order	Highest order of derivative in equation
Solution of the Equation on Interval I	Any function defined on an interval I and possessing at least n derivatives that are continuous on I, which when substituted into an nth order differential reduces the equation to an identity
Classification by linearity	F has to be linear in each of its derivatives. The power on each term of y will need to be 1.

Initial Value Problems

Consists of a differential equation and a set of conditions that should be true for a solution and its derivative. The order on the highest derivative is the amount of initial conditions needed to find an exact equation.

Examples

$$y'' - 6y' + 13y = 0;\ y = e^{3x}\cos 2x$$

Verify that the indicated function is a solution to the differential equation

Linearity

$$(x + y)\,dx + (3x^2 - 1)dy = 0$$

$$(2x^2 + y^2)\,dx + (2xy)dy = 0$$

Determine whether the Differential Equation is linear or nonlinear

By **Algae**
cheatography.com/algae/

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