Definitions for Ordinary Differential Equations

1. A **differential equation** is an equation involving an unknown function and its derivatives.

2. A differential equation is an **ordinary** differential equation if the unknown function depends on only one independent variable, otherwise it is a **partial** differential equation.

3. The **order** of a differential equation is the order (number of derivatives taken) of the highest derivative appearing in the equation.

4. The **degree** of a differential equation that can be written as a polynomial in the unknown function and its derivatives is the power to which the highest order derivative is raised.

5. An $n^{th}$ order differential equation is **linear** if it has the form

$$a_n(x)y^{(n)}(x)+a_{n-1}(x)y^{(n-1)}(x)+\ldots+a_0(x)y(x) = b(x)$$

A linear equation is **homogeneous** if $b(x) = 0$
6. A **solution** of a differential equation in the unknown function $y$ and the independent variable $x$ on the interval $I$ is a function $y(x)$ that satisfies the differential equation identically for all $x$ in $I$.

7. A **particular** solution is any one solution. The **general solution** is the set of all solutions.

8. An **initial value problem** is a differential equation together with conditions (known as initial conditions) on the unknown function and its derivatives all at the same value of the independent variable.

9. A **boundary value problem** is a differential equation together with conditions (known as boundary conditions) on the unknown function and its derivatives at more than one value of the independent variable.

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