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.