Other Types of Differential Equations

- Most of the ODE solvers are for problems written in the *normal form*:

$$\frac{dy}{dt} = f(t, y)$$

  where y could be a column vector.

  - ◇ We only have been dealing with the *initial value problem*, i.e., a problem where the initial condition $y(t_0) = y_0$ is given.
  - ◇ Another class of problems, called the *boundary value problem*, need to solved in a totally different approach. (We did not discuss this approach.) The condition associated with this problem is usually described in the form $g(y(a), y(b)) = 0$ where g is some prescribed function.

- There are many other types of differential equations that may or may not be changed to the normal form.

  - ◇ Differential Algebraic Equations:

$$F(t, y, \frac{dy}{dt}) = 0$$

    where F is a certain specified function.

  - ◇ Partial Differential Equations:

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f(x, y)$$

    where u is a function of two independent variables.

- Many more work and research need to be done on the general type of differential equations.