

## 1.1 Some Basic Mathematical Models; Directional Fields

Equations containing derivatives are **differential equations**.

A differential equation that describes some physical process is a **mathematical model** of the process.

**Direction Fields** are valuable tools in studying the solutions of differential equations of the form

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

where  $f$  is a given function of the two variables  $t$  and  $y$ , sometimes called the **rate function**.

To model population growth, an equation in the form

$$\frac{dp}{dt} = rp - k$$

may work, where  $r$  is the growth rate and  $k$  is the predation rate. The equilibrium solution for this equation is  $k/r$ .