

5.4 – Differential Equations

Definitions: A **differential equation** is an equation involving unknown functions and their derivatives.

The **order** of a differential equation is the order of the highest derivative it contains.

A differential equation of the form $y' = ay$ has a **general solution** of the form $y = ce^{ax}$.

A condition which specifies the value of the general solution at a point is called an **initial condition**, and the problem of solving a differential equation subject to an initial condition is called an **initial-value problem**.

A **constant coefficient first-order homogeneous linear system** has the form

$$\begin{aligned}y_1' &= a_{11}y_1 + a_{12}y_2 + \dots + a_{1n}y_n \\y_2' &= a_{21}y_1 + a_{22}y_2 + \dots + a_{2n}y_n \\&\vdots \qquad \qquad \qquad \vdots \quad \vdots \quad \vdots \\y_n' &= a_{n1}y_1 + a_{n2}y_2 + \dots + a_{nn}y_n\end{aligned}$$

where $y_i = f_i(x)$ are functions to be determined, and the a_{ij} 's are constants.

