# Lab sheet - 5

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1. Find the analytical solution of the differential equation,

$$\frac{d^2y}{dx^2} = -y, \quad \text{with B.C. } y(x=0) = 0 \text{ and } y(x=\pi/2) = -3$$

Solve this boundary value problem using the shooting method, and compare the numerical values with the analytical results.

2. Consider the following differential equation,

$$\frac{d^2y}{dx^2} - 2\,y = 8\,x(9-x), \quad \text{with B.C. } y(x=0) = 0 \text{ and } y(x=9) = 0$$

Solve this boundary value problem using the shooting method by RK-2, and plot $y$ as a function of $x$.

3. Consider the following differential equation,

$$\frac{d^2y}{dx^2} + 4\,y = \cos(x), \quad \text{with B.C. } y(x=0) = 0 \text{ and } y(\pi/4) = 0$$

Solve this boundary value problem using the shooting method by RK-4, and plot $y$ as a function of $x$.

4. Solve the following second order differential equation using RK 4 method

$$\frac{dy^2}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2\,, \quad \text{where } y(x=0) = 1 \text{ and } y'(x=0) = 0$$