1. **25 points** Apply the Linear Shooting method to solve

\[ y'' = 4(y - x), \quad x \in (0, 1), \]
\[ y(0) = 0, \quad y(1) = 2 \]

and write down the detailed algorithm using the 4th order Runge-Kutta method.

2. **25 points** Apply the Nonlinear Shooting method to solve

\[ y'' = -(y')^2 - y + \ln x, \quad x \in (1, 2), \]
\[ y(1) = 0, \quad y(2) = \ln 2 \]

and write down the detailed algorithm using the 4th order Runge-Kutta method.

3. **25 points** Apply the Linear Finite-Difference method to solve

\[ y'' = 4(y - x), \quad x \in (0, 1), \]
\[ y(0) = 0, \quad y(1) = 2 \]

and write down the detailed algorithm.

4. **25 points** Apply the Nonlinear Finite-Difference method to solve

\[ y'' = -(y')^2 - y + \ln x, \quad x \in (1, 2), \]
\[ y(1) = 0, \quad y(2) = \ln 2 \]

and write down the detailed algorithm using the Newton method.