1. Use the method of homogenous equations to solve the following differential equation

\[(x^2 + 3y^2)dx - 2xydy = 0\]  \hspace{1cm} (1)

with \(y(2) = 6\).

2. Solve the following differential equation.

\[(6xy + 2y^2 - 5) + (3x^2 + 4xy - 6) \frac{dy}{dx} = 0\]  \hspace{1cm} (2)

3. Given that \(f(x) = x\) is a solution of

\[(1 - x^2)y'' - 2xy' + 2y = 0\]  \hspace{1cm} \text{within} \quad -1 < x < 1 \hspace{1cm} (3)

find a second linearly independent solution.

4. Find the general solution of

\[y^{(4)} - 3y''' - 2y'' + 2y' + 12y = 0\]  \hspace{1cm} (4)

5. Solve the initial value problem

\[y'' - y' - 6y = 8e^{2x} - 5e^{3x}\]  \hspace{1cm} \text{with} \quad y(0) = 3 \quad \text{and} \quad y'(0) = 5 \hspace{1cm} (5)

\[\text{Upload to NINOVA system before 22 March 2013}\]