1. Consider the equation

\[ xu_{xx} - yu_{yy} + \frac{1}{2}(u_x - u_y) = 0, \quad x > 0, \quad y > 0. \]

(a). Reduce the equation to the canonical form.
(b). Find the general solution of the equation.

2. Solve the Neumann problem

\[
\Delta u = 0, \quad x^2 + y^2 < 16 \\
\frac{\partial u}{\partial n} = y, \quad x^2 + y^2 = 16.
\]

3. Consider the following initial value problem \( u_t + uu_x = 0, \ u(x,0) = g(x). \) Solve the problem by the method of characteristics.

4. Find a solution of the problem \( u_{xx} + u_{yy} = 0, \ -\infty < x < 0, \ 0 \leq y \leq h < \infty, \) with \( u(x,0) = u(x,h) = 0, \ u(0,y) = 1, \) and \( u(x,y) \to 0 \) as \( x \to -\infty. \)