Homework 1

1. Solve the equation

$$3U_y + U_{xy} = 0$$

2. Solve the equation

$$(1+x^2) U_x + U_y = 0 \qquad \text{and}$$

sketch some of the characteristic curves.

3. Solve

$$aU_x + bU_y + cU = 0 \qquad , \; a,b,c \in \mathbb{R}$$

4. Solve $aU_x + bU_y = f(x,y)$, $a,b \in \mathbb{R}$

where $f(x,y)$ is a given function

Show that
$$U(x,y) = (a^2+b^2)^{-\frac{1}{2}} \int_L f \, ds + g(bx - ay)$$

where g is arbitrary function of 1 variable and L is the characteristic line segment from the y axis to

the point (x, y), and the integral is a line
integral.

5. Solve

$$U_x + 2U_y + (2x - y)U = 2x^2 + 3xy - 2y^2$$