

**Partial Differential Equations:
12th problem sheet**

Exercise 45: First order PDE I

Solve the problem

$$xu_x + yu_y = 2u \quad u(x, 1) = g(x)$$

applying the method of characteristics.

Exercise 46: First Order PDE II

Solve the inhomogeneous equation

$$u_t + b \cdot Du + cu = f(x, t) \quad u(x, 0) = g(x)$$

for fixed $b \in \mathbb{R}^n, c \in \mathbb{R}$ using the method of characteristics.

Exercise 47: First Order PDE III

Compute a complete integral for the equations

$$u_x u_y = 1$$

Use a sum ansatz.

Exercise 48: First Order PDE IV: Burgers' equation

Use the method of characteristics to solve the problem

$$u_y + uu_x = u^2 \quad u(0, y) = y.$$