# First Order PDE

List 4 (20.02.2018)

Deadline — 13.03.2017.

1. Find a surface which satisfy the equation

$$\operatorname{tg} x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = z$$

and contains the line $y = x$, $z = x^3$.

2. (a) Construct a general equation of surfaces that intersect at the angle $90^o$ surfaces of the family $z^2 = Cxy$.

(b) Find the surface passing through the line $y = x$, $z = 1$ and orthogonal to the surfaces

$$x^2 + y^2 + z^2 = Cx.$$

3. Write a partial differential equation that is satisfied by all cylindrical surfaces with generators parallel to the vector $(a, b, c)$. Find the general solution of this equation.

4. Find the solution of the equation $(\frac{\partial u}{\partial x})^2 + (\frac{\partial u}{\partial y})^2 = 1$ with the given initial condition $u|_{y=0} = u_0(x)$.

5. Find the solution of the equation $u = (\frac{\partial u}{\partial x})^2 + \frac{\partial u}{\partial y}$ with the initial condition a) $u|_{y=0} = 1$; b)* $u|_{y=0} = x$.