Universität des Saarlandes
Fachrichtung 6.1 – Mathematik
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PDE and Boundary-Value Problems (Winter Term 2012/2013)
Assignment H1 - Homework

Problem 1.1 (Classification - 4 Points)

Classify the following equations:

(a) $u_t = u_{xx} + 2u_x + u$

(b) $u_t = u_{xx} + e^{-t}$

(c) $u_{xx} + 3u_{xy} + u_{yy} = sinx$

(d) $u_{tt} = uu_{xxxx} + e^{-t}$

Problem 1.2 (Transformation into canonical form - 12 Points)

Transform into canonical form the following equations

(a) $u_{xx} - 2xu_{xy} - \frac{1}{x}u_x = 0, \qquad x > 0,$

(b) $u_{xx} + 2u_{xy} + x^2 u_x = e^{-x^2/2}.$

Problem 1.3 (Solving PDE - 5 Points)

Can you find all functions $u(x, y)$ that satisfy to the equation

$$\frac{\partial^2 u(x, y)}{\partial x \partial y} = 0?$$

How many are there?

Problem 1.4 (Formulation of IBVP - 4 Points)

Suppose a laterally insulated metal rod of length $L = 1$ has an initial temperature of $\sin(3\pi x)$ and has its left and right ends fixed at temperatures zero and $10°C$. What would be the IBVP that describes this problem?

Deadline for submission: Thursday, October 31, (Room 433, Bilding E2 4)