

SOMMERSEMESTER 2016 - HÖHERE ANALYSIS II
LINEARE PARTIELLE DIFFERENTIALGLEICHUNGEN

Homework #3 due 5/10

Problem 1. Let $x \in \mathbb{R}^d$ be a column vector and let I be the $d \times d$ identity matrix. Prove that $\det(I + xx^T) = 1 + |x|^2$.

Problem 2. Compute the distributional derivative $\frac{d^4}{dx^4}|x|^3$.

Problem 3. Given $f \in L_1(\mathbb{R})$ and $a \in \mathbb{R}$. Show that the function $u(t, x) = f(x - at)$ is a distributional solution to the PDE $u_t + au_x = 0$, that is

$$u_t(\varphi) + au_x(\varphi) = 0 \quad \text{for all } \varphi \in \mathcal{D}(\mathbb{R}^2) .$$