

Math 2900 – Spring 2008
Homework IV
Due Feb 8

Problem 1: Solve

$$u_{tt} = c^2 u_{xx}, \quad u(x,0) = f(x), \quad u_t(x,0) = g(x)$$

as an initial value problem for the vector $(u_1, u_2) = (u_t, u_x)$

Problem 2: Let α, β, γ be multiindexes. With n components. Prove

(a) The binomial theorem $(x + y)^\alpha = \sum_{\substack{\beta, \gamma \\ \beta + \gamma = \alpha}} \frac{\alpha!}{\beta! \gamma!} x^\beta y^\gamma$

(b) $\alpha! \leq |\alpha|! \leq n^{|\alpha|} \alpha!$

(c) Taylor expansion $f(x) = \sum_{|\alpha| \leq m} \frac{1}{\alpha!} (D^\alpha f(0)) x^\alpha$