

# MAT 576

Fall 2008

## Homework set 5

Problems from the textbook: 4.19, 4.22, 4.25, 4.26

1. Is the condition  $u > 0$  in the statement of Theorem 4.21 really used, or does it only require that  $u \geq 0$ ? Explain.
2. Using Theorem 4.11 as a model, state and prove a theorem that provides an *a priori* bound for the solution of the initial value problem

$$-\frac{\partial u}{\partial t} + a_{ij}(\mathbf{x}, t) \frac{\partial^2 u}{\partial x_i \partial x_j} + b_i(\mathbf{x}, t) \frac{\partial u}{\partial x_i} + c(\mathbf{x}, t)u = f(\mathbf{x}, t), \quad \mathbf{x} \in \Omega, \quad 0 < t < T,$$

$$u(\mathbf{x}, 0) = u_0(\mathbf{x}), \quad \text{and } u(\mathbf{x}, t) = \psi_0(\mathbf{x}, t) \text{ if } \mathbf{x} \in \partial\Omega, \quad 0 < t \leq T.$$