

MATH/AMSC 673 (Fall 2004)
PARTIAL DIFFERENTIAL EQUATIONS
HOMEWORK 3 (Due October 14)

Problem 1.

Solve the problem [Evans 2.5 #4].

Problem 2. [Qualifying Exam]

Suppose that $u \in C^2(\mathbf{R}_+^2) \cap C^0(\mathbf{R}_+^2)$ is harmonic in \mathbf{R}_+^2 and bounded in $\mathbf{R}_+^2 \cup \partial\mathbf{R}_+^2$. Prove the maximum principle

$$\sup_{\mathbf{R}_+^2} u = \sup_{\partial\mathbf{R}_+^2} u$$

Hint: Consider for $\epsilon > 0$ the harmonic function

$$v_\epsilon(x, y) = u(x, y) - \epsilon \ln(x^2 + (y + 1)^2).$$