

**Math 333 Homework Problems #6**

APPLIED PARTIAL DIFFERENTIAL EQUATIONS (2ND EDITION), by J.D. Logan

**4.3. Laplace's equation**

- **4.3.3**
- **4.3.9** Consider the *exterior* boundary value problem

$$\begin{aligned}\Delta u &= 0, & r > R, & 0 \leq \theta < 2\pi \\ u(R, \theta) &= f(\theta), & 0 \leq \theta < 2\pi.\end{aligned}$$

Find the series solution. (Note that in Problem 4.3.1 the series solution can be represented as an integral.)

- **4.3.10** This is an extension of Problem 4.3.3. Solve the following boundary value problem on a wedge:

$$\begin{aligned}\Delta u &= 0, & 0 < r < R, & 0 \leq \theta \leq \pi/2 \\ u(R, \theta) &= f_R(\theta), & 0 \leq \theta \leq \pi/2 \\ u(r, 0) &= 0, & u_\theta(r, \pi/2) &= f_T(r), & 0 < r < R.\end{aligned}$$

Plot the solution for the special case of

$$R = 4, \quad f_R(\theta) = \sin(\theta) - .7 \sin(3\theta), \quad f_T(r) = r(R/3 - r)(R - r).$$