



# Math 942

## HW2 – Due Monday Oct. 22



From Holmes

Section	Page Number	Problems
2.2	57-60	2(acef), 10, 14
2.3	65-67	1(ach), 3
2.4	73-77	1(ac), 2
2.5	82-84	1(a)

## Non-book Exercises

1) Find a two term expansion for the solution  $u$  of

$$u_{rr} + \frac{1}{r}u_r + \frac{1}{r^2}u_{\theta\theta} = 0,$$

with boundary conditions

$$u(1 + \epsilon \cos \theta, \theta) = \sin \theta.$$

on the domain  $D = \{(r, \theta) \mid 0 < r < 1 + \epsilon \cos \theta\}$ .

2) Consider

$$\epsilon^2 u'' + u^2 - 1 = 0,$$

$$u(0) = u(1) = 0,$$

on  $0 \leq x \leq 1$ . Use an asymptotic expansion, and phase-plane methods, to determine the possible multi-layer solutions. Sketch the 1 and 2 layer solutions, indicating Max and Min values of each layer. Estimate the maximum number of layers possible.