

University of Delaware
Department of Mathematical Sciences
Math 810 Asymptotic and Perturbation Methods 09S
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Homework 3: Due 3/13/09

1. Using a matched asymptotic expansion, find the leading order uniformly valid solution to the 2-point boundary value problem for $y(x)$:

$$\epsilon y'' + a(x)y' + b(x)y = 0, \quad 0 < x < 1, \quad y(0) = A, \quad y(1) = B.$$

Here $0 < \epsilon \ll 1$ and $a(x) < 0$ on $0 \leq x \leq 1$.

2. Find the two-term uniformly valid solution approximating $y(x)$ for the problem

$$\epsilon y'' + [-1 + \alpha(x - 1)]y' + \alpha y = 0, \quad 0 < x < 1, \quad y(0) = 1, \quad y(1) = 0.$$

Here α is a positive constant and $0 < \epsilon \ll 1$.