MSM3A05a/MSM4A05a Problem Sheet 5.

QUESTION 1.

Consider the differential equation below

$$\epsilon y'' + xy' + y = 0, \qquad -4 \leq x \leq -2, \qquad 0 < \epsilon \ll 1, \quad y(-4) = 1, \quad y(-2) = 0.$$

(a) Assume that the boundary layer is located at $x = -2$. Write down a one term outer solution.
(b) Write down a one term inner expansion.
(c) Match these two expansions to find a one term composite solution.

QUESTION 2.

Consider the differential equation below

$$\epsilon y'' + (x+1)y' + y = 2x, \qquad 0 \leq x \leq 1, \qquad 0 < \epsilon \ll 1, \quad y(0) = 1, \quad y(1) = 2.$$

(a) Assume that the boundary layer is located at $x = 0$. Write down a two term outer solution.
(b) Write down a two term inner expansion.
(c) Match these two expansions to find a composite solution.

JU 02/12/10.