Homework 2

Problem 1: Find the asymptotic series of the root of

$$e^{-x} - x - 1 + \epsilon = 0$$

for small ϵ. Use the iterative method to find out what the correct asymptotic sequence to use should be, then use that as an ansatz to get the first 4 non-zero terms of the actual solution .

For extra practice: Do problem 1 page 36

Problem 2: Problem 2 page 37.

For extra practice: Do problem 3 page 47

Problem 3: Problem 4 page 48.

Problem 4: Use the tools learned in class to solve the initial value problem

$$\frac{df}{dx} - \epsilon f + 1 = 0$$
$$f(0) = \epsilon$$

for small ϵ. You only need to find the first 2 terms in the expansion. Calculate the true solution, and plot both the true solution and your approximate one on the same graph. Is the expansion (at least to that order) uniform or non-uniform? Justify your answer.

Problem 5: Use the tools learned in class to solve the boundary value problem

$$\frac{d^2 f}{dx^2} - 2\frac{df}{dx} + \epsilon f = 0$$
$$f(0) = 0 \text{ and } f(1) = 1$$

for small ϵ. You only need to find the first 2 terms in the expansion. Calculate the true solution, and plot both the true solution and your approximate one on the same graph. Is the expansion (at least to that order) uniform or non-uniform? Justify your answer.