Week #3: Friday, April 11
Reading: Bender & Orszag, Chapters 6, 7, 9
Homework: Due in class, Monday, April 21.

1. Work through Example 7 of section 6.4, page 269. Reproduce Figure 6.2 any way you like.

2. B+O problem 7.14

3. B+O problem 7.30

4. The function \( y(x, \epsilon) \) satisfies
   \[
   \epsilon y'' + y' y - y = 0, \quad 0 \leq x \leq 1
   \]
   with \( y(0) = 0, \quad y(1) = 3 \) and with \( 0 < \epsilon << 1 \). Assuming that there is a boundary layer only near \( x = 0 \), find the leading order terms in the outer and inner approximations and match them. Write down the composite solution, and compare with a numerical solution from matlab or mathematica.

5. Solve
   \[
   \epsilon y''' - y' + xy = 0, \quad 0 \leq x \leq 1
   \]
   with \( y(0) = y'(0) = y(1) = 1 \). Plot the resulting functions \( y_{\text{out}}, Y_{\text{inner}} \) (both left and right inner functions) and \( y_{\text{comp}} \) for \( \epsilon = 0.1 \).