Math 46: Applied Math: Homework 3

due Wed Apr 20 ... but best if do relevant questions after each lecture

This week, beautiful perturbation theory, both regular and singular.

p.100-104: #7. The powers of ε you need might be unusual; choose them so that terms in each power can successfully be matched. [Hint: think about related equation $z^3 = \varepsilon$].

#14. [Hint: look back at #4]. Finding the exact solution you don't need to do—I will treat it as a BONUS since I can't do it without using weird special functions!

#16. Fun quick one since little algebra needed. In order to answer the last question please state the error with which the ODE is satisfied (*i.e.* , $F(t, y, y', y'', \varepsilon) := y'' - \varepsilon t y$).

p.111-112: #1. b, c.

#2. Remember to do all three roots.

p.121-123: #1. a (easy, follow recipe), f (you'll need to resort to a special function familiar from statistics!), h (quick but weird, please explain what's going on), i. [Hint: with all these questions first make sure you know, and state, where (and if) there is a boundary layer! A sketch often helps you and me too]

#2. Easy but very insightful.

#3. You don't need to write the uniform approximation. Do explain what goes wrong to cause the usual boundary layer to fail.

#4. Please give a sketch of the solution.