

Homework for Nov 10.

1. Page 206, 7,8 (section 5.2)
2. page 498, 2,7
3. Consider the equation:

$$\frac{dy}{dx} = -y + \epsilon y^2, \quad y(0) = 1$$

- (a) Determine the solutions in terms of  $\epsilon$  to order 2 (that is  $y_0, y_1, y_2$ ).
- (b) Show that the exact solution is

$$y = e^{-x}[1 + \epsilon(e^{-x} - 1)]^{-1}$$

- (c) Expand the exact solution in  $\epsilon$  and compare to your answer in the first part.
  - (d) Is this expansion valid for all  $x$
4. Consider the differential equation:

$$\frac{dx}{dt} = 1 + \epsilon f(t)g(x), \quad x(0) = 0$$

where all functions are smooth. Compute the time it takes for  $x(t) = 1$  up to order  $\epsilon$ .