Math 46: Applied Math: Homework 1

due Wed Apr 2 ... but best if do relevant questions after each lecture

p.7-8: #2 [hint: what are the dimensions of energy?]

#5 (be careful to answer, briefly, all questions)

#6. Please choose your definitions of s and y so the plot is a straight line [Hint: choose y to not involve v]. The plot can be a sketch showing intercept and slope.

p.17-19: #1, (easy),

#9. 'concentration' means mass density; for the last step follow the text above Eqn (1.9) and keep in mind you have *freedom* to choose convenient dimensionless params that get you to the requested law.

p.30-34: #3 (it's it nice how 3 parameters a, b, ρ can be reduced to *zero* parameters by rescaling?) Don't forget to un-rescale when you present your solution for $x(t)$.

#4 (you should end up with an ODE with a single small parameter ε - what is it?),

#10 (now several steps are left up to you; you should end up with only one free parameter).

#11 (when you reformulate the problem in b, don't forget the initial conditions too. How many ways of nondimensionalizing the problem are there?).

p.40-44: #1 a, b, c, d, h. These are review of Math 23; keep in mind the tricks on p.38. Sorry about part b, but I have to do this to you to get you back into ODEs! [Hint: save spacetime by abbreviating s for $\sin 2t$ and c for $\cos 2t$].

#3 Since you've already done a and most of b, finish b and answer the slightly tricky first question in c. You'll need to remind yourself of a vaguely-remembered integral. [Hint for c: to check, do you get the expected time when air resistance vanishes?]