Math 2250-4
Week 2 concepts and homework, due January 20.

Recall that problems which are not underlined are good for seeing if you can work with the underlying concepts; that the underlined problems are to be handed in; and that the Friday quiz will be drawn from all of these concepts and from these or related problems.

You should also try the software Maple this week. There are documents on our homework page that you can work through. We will run optional introductory Maple sessions in LCB 115 next week. The first two are Tuesday 1/17 3-3:50 p.m. and Wednesday 1/18 11:50 a.m.-12:40 p.m. More will be announced.

1.3:
3, 6, 9: geometric meaning of how slope fields relate to graphs of solutions to DE's and to IVP's
*11, 12, 13, **14**: understanding the existence-uniqueness theorem for solutions to IVP's*

(study section 1.4 separable DE's before doing these):
w2.1) In problem 1.3.11 above, the existence-uniqueness theorem guarantees a unique solution to the given initial value problem, on some interval containing $x = 1$. Use separation of variables to find this solution. What is the largest interval on which this solution exists and is the unique IVP solution? Explain.
w2.2a) Consider a function whose graph $y = y(x)$ has the properties that the graph passes through the point $(x, y) = (2, 3)$, and that the normal line at every point (x, y) on the graph passes through the point $(2, 0)$. Show that the function $y(x)$ satisfies the initial value problem

$$\frac{dy}{dx} = \frac{(2 - x)}{y} \quad .$$
$$y(2) = 3.$$

w2.2b) Using the version of the existence-uniqueness theorem on page 28 of the text (and in our class notes), determine whether there is a unique solution to this IVP on some open interval containing the point $x = 2$.
w2.2c) Use "dfield" to plot the slope field and the graph of the solution to the initial value problem above, within the rectangle $-2 < x < 6$, $-2 < y < 6$. Recall that you can find the applet "dfield" with google. Print out a copy of this picture. (On my computer it's easiest to first take a screen shot, and print that out.) Explain why the solution does not appear to exist for the entire interval $-2 < x < 6$.
w2.2d) Notice that the differential above is separable (section 1.4). Solve the initial value problem for $y = y(x)$ and explain why the dfield picture in part (c) is consistent with this solution function. Does you solution make sense in terms of the original description of the solution's graph?

1.4:
***2**, 3,4,9,13,19,**20**: solving DE's and IVP's for separable differential equations*
***40**, 45, **46**, 49, **54**: modeling and solving problems with first order separable DEs.*

1.5:
*1, 7, 8, 13 20, **24,** solving linear DE's and IVP's.*
*33,**36, 38, 41:** modeling and solving problems with first order linear DE's.*