Math 2250-1
Week 3 concepts and homework, due September 9.

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. Your first Maple homework is also due on September 9. It is posted on our homework page.

2.1:
1,3,6: solving IVP's for first order autonomous DE's with quadratic right hand sides, using partial fractions.
***10, 12, 23**, 33: deriving and solving 1st order autonomous DE's from model descriptions.*
***w3.1)** In problem 23, use dfield to plot the differential equation slope field for* $0 \le t \le 3$ and $-50 \le x \le 250$. Use the dfield option which lets you specify initial values, and add the graph of the solution to the IVP in 23, along with the graphs of the two equilibrium solutions. Use your mouse to find the time when the solution to the IVP in 23 satisfies $x(t) = 100$. Print out a copy of your plot; add the coordinates of this intersection point at which $x = 100$. Is the $t-$ coordinate of this point consistent with your work in 23b?

2.2:
5,7,9,11: equilibria, stability, phase portraits, slope fields for autonomous first order DE's
w3.2) Consider the differential equation

$$\frac{dx}{dt} = x^2 \cdot \left(x^2 - 9\right) .$$

Find the equilibria; draw the phase portrait; classify the equilbria as stable, asymptotically stable, or unstable (possibly one-sided stable); use dfield to sketch the slope field and representative solution graphs, including the graphs of the equilibrium solutions, to verify your phase portrait analysis. Include this plot in your homework.
***23)**: using phase portraits to analyse long-time behavior in mathematical models.*