MATLAB I

Read section 2.5 *Autonomous Equations and Population Dynamics*, and in particular the qualitative behavior of the logistic equation:

$$\frac{dy}{dt} = r\left(1 - \frac{y}{K}\right)y,$$

then answer/do the following:

(a) What is the physical meaning of r and K, if the above equation is used to model the population of a certain specie?

(b) Using $r = 2$ and $K = 3$. Plot the direction field using the matlab script dfield7. To download this script, go to http://math.rice.edu/~dfield/matlab7/dfield7.m, then save the file to a local directory using the "Save Page As..." option from the right-click mouse menu. From the matlab command line, make sure that the file dfield7.m is in your current working directory, then type dfield7 to run.

(c) Discuss the qualitative behavior of the solutions of the o.d.e using the direction field from part 1.

(d) Pick (if possible) four initial conditions, and use dfield7 to show that these initial conditions lead to solutions of the following form:

1. Given the chosen initial condition, the solution decreases to negative infinity;
2. Given the chosen initial condition, the solution increases to positive infinity;
3. Given the chosen initial condition, the solution decreases to equilibrium;
4. Given the chosen initial condition, the solution increases to equilibrium;

To obtain full credit, the student should submit a typewritten document, containing the answers to the above problem, including the plot of the direction field and one plot for each choice of initial condition from part (d) (whenever the requested initial condition exists).
To superimpose a solution on the direction field, use the Option menu on the dfiled7 Display.