Math 222, Spring 2016.

Present your work in an organized fashion. Make sure that your work is algebraically correct and logically sound. Show all your work. Discussion (if necessary) with others is encouraged, while copying other's solution is a violation of NJIT student honor code. Do not forget that you should also be able to do (but not hand in) the homework problems listed on the syllabus.

Homework Problems for Week 2

1. Consider the initial value problem

$$y' + \frac{2}{3}y = 1 - \frac{t}{2} \quad ; \; t > 0, \qquad y(0) = y_0$$

   (a) Use dfield (Java version) or dfield8 (Matlab version) to plot the direction field of the differential equation with the Display window set for $0 \leq t \leq 20$ and $-10 \leq y \leq 5$. Set the window properties to use arrows when displaying the direction field. Print out your plot, it is the answer to this part of the problem.

   (b) Use the method of the integrating factor to find the general solution of the differential equation, and then find the solution of the initial value problem with $y_0 = 2$.

   (c) Using the solution of the differential equation for any initial value y_0, find the value of y_0 for which the solution touches, but does not cross, the $t-$axis.

   (d) Use dfield (Java version) or dfield8 (Matlab version) to plot solutions of the initial value problem for $-5 \leq y_0 \leq 5$ with increment of 0.25 (that is $y_0 = -5, \; -4.75, \; -4.5, \; ..., \; 4.75, \; 5$). The Display window should be set as in the first part of this problem and set the solution direction to Forward. The single plot with all the solutions on it is part of the answer for this part of the problem. You will notice that all these solutions appear to converge to a certain function. Find an equation for that certain function using your plot (print it out and work with it). Does this agree with the large$-t$ behavior of the solution you found in part (b) ? Explain.

2. Solve Problem 22 from Section 2.2 of the textbook. Look at page 12 of the textbook (near the bottom of the page) for a definition of "integral curves."