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.

Homework Problems for Week 1. MATH 222, Spring 2016.

- Problem 1. Consider the differential equation $\frac{dy}{dt} = 2y - 3$.

  (a) What type of differential equation (order, linear or nonlinear) is this? Draw a direction field for this differential equation.

  (b) Verify that $y(t) = \frac{3}{2} + \left(c - \frac{3}{2}\right) e^{2t}$ is a solution for any value of c.

  (c) Confirm that $y = \frac{3}{2}$ is a solution.

  (d) Based on the solution in **(a)**, how does the solution behave as $t \to \infty$ when $c > \frac{3}{2}$? What is the behavior when $c < \frac{3}{2}$? What does this tell us about the solution $y = \frac{3}{2}$? Show that this is consistent with the direction field you draw for **(c)**.

- Problem 2. Consider the differential equation $\frac{dy}{dt} = \sin(y) - a$ with a a positive constant $(a > 0)$.

  (a) What type of differential equation (order, linear or nonlinear) is this?

  (b) Draw a direction field for $a = 0.5$.

  (c) Draw a direction field for $a = 1.5$.

  (d) Based on your direction field for (**b**) and (**c**), what can you conclude about the behavior of the solution for different values of a?