Math 201, Assignment 1
Due at the beginning of tutorial on May 20, 2015
Illegible or disorganized solutions will receive no credit! Please, for the sake of our markers, be neat!

1) Determine the values of m, for which $y = e^{mx}$ is a solution of the differential equation

$$y'' - 5y' + 6y = 0.$$

If y_1 and y_2 are solutions to the differential equation above and c_1 and c_2 are constants, is $y = c_1y_1 + c_2y_2$ also a solution? Why or why not?

2) Find the 1 parameter family of solutions to

$$y' = (x + 5)(x - 3)^{-1}(x + 1)^{-1}.$$

Show which values of $x_o \in \mathbb{R}$ guarantee existence and uniqueness of the solution to the IVP $y(x_o) = y_o$ by invoking an appropriate theorem from the text.

3) When an object at room temperature is placed in an oven whose temperature is constant at T_f, the temperature of the object will increase with time, approaching the temperature of the oven. The temperature T of the object is related to time by through the differential equation

$$T' = k(T - T_f)$$

where k is a real constant.

Given that $T(0) = T_i$, use separation of variables to solve this IVP for T in terms of the independent variable, t, and the constants, k, T_f and T_i.

4) Solve by separating variables, the initial value problem

$$y' = xy^2e^x, \quad y(0) = 2$$

and comment on uniqueness of the solution.

5) Find a 1 parameter family of solutions to the following first order linear differential equation,

$$x^3\frac{dy}{dx} + x^2y = x.$$