Math 2214  Homework 8  Spring 2015
Show all work and staple multiple pages.

Problem 1:
Solve the following higher order differential equations (no initial values)

a) \( y''' + 2y'' - 8y' = 0 \)

b) \( y''' + y'' + 3y' - 5y = 0 \)

c) \( y^{(4)} + 4y'' + 4y = 0 \)

d) \( y^{(4)} - y''' + y' - y = 0 \)

Problem 3:
Given the 3rd order linear differential equation
\( y''' + 2y'' - 5e^t y' - 6y = \cot(t) \)
Set up the system of first order linear differential equation that is associated with this differential equation and put it in matrix form, \( Y' = P(t)Y + G(t) \)

Problem 4: Given a 4th order linear differential equation with initial values
\( y(0) = 0, y'(0) = -1, y''(0) = -4, y'''(0) = y_1, y_2, y_3, y_4 \) and solutions \( y_1 = 1, y_2 = t, y_3 = \cos(2t), y_4 = \sin(2t) \):

a) Verify that they form a fundamental set using the Wronskian and Abel’s Theorem.

b) Find the unknown coefficients when the general solution is given by
\( y = C_1y_1 + C_2y_2 + C_3y_3 + C_4y_4 \).

Problem 5: Given the system
\( Y' = AY \)
\( Y' = \begin{bmatrix} -3 & -2 \\ 4 & 3 \end{bmatrix} Y \) and \( Y(0) = \begin{bmatrix} 1 \\ -3 \end{bmatrix} \) with solutions
\( Y_1 = e^t \)
\( Y_2 = e^{-t} \)

Set up the general solution: \( Y = C_1Y_1 + C_2Y_2 \) and solve for the coefficients.