Ma 221 - Differential Equations **Homework 3** **Due: Friday, Sep 24, 2021**

See the canvas assignment page for detailed instructions on submitting your work.

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1. (a) Find a third-order linear ODE with constant coefficients whose general solution is given by,

$$y_c(x) = e^{-x}\big(C_1\cos(3x) + C_2\sin(3x)\big) + C_3e^{-3x}.$$

   (b) Find a fourth-order linear ODE with constant coefficients whose general solution is given by,

$$y_c(x) = C_1\cos 2x + C_2\sin 2x + C_3e^{-2x} + C_4e^{2x}.$$

2. (a) Find the general solution to $L[y] = y''' + y' + 10y = 0$ if one of the solutions is known to be $y_1(x) = e^x\sin(2x)$.

   (b) Find the general solution to $L[y] = y''' + 5y'' + 8y' + 4y = 0$.

3. Consider the linear second-order ODE, $L[y] = y'' - 4y' + 4y = 6x^2e^{2x}$.

   (a) Use ***variation of parameters*** to find a particular solution, $y_p(x)$.

   (b) Determine the *general solution* for the ODE.

4. Solve the initial value problem, $L[y] = y'' - 2y' + y = 4e^t\ln t,\ y(1) = 0,\ y'(1) = 0.$