This assignment is your first Lecture Activity to have you actively work with the lecture notes presented in class and available on my website. This activity is meant to keep you engaged and current with the class, so there is a fairly rapid turn around (due by **Mon. Aug 30 by noon**). There are 4 problems that require written answers, which are entered into **Gradescope**.

Note: For full credit you must show intermediate steps in your calculations.

1. (2pts) Consider the fourth order scalar ODE given by:

$$y'''' - 16\,y = 0.$$

Let $y_1(t) = y(t)$, $y_2 = \dot{y}_1$, $y_3 = \dot{y}_2$, and $y_4 = \dot{y}_3$. Create a first order linear system of the form:

$$\dot{\mathbf{y}} = A\mathbf{y}, \tag{1}$$

where $\mathbf{y} = [y_1, y_2, y_3, y_4]^T$ and you find A. (Slides Intro 13-16)

2. (4pts) Continuing Problem 1, find the eigenvalues and eigenvectors of A.

3. (4pts) Continuing Problem 2, write the complex and real solutions of Eqn. (1).

4. (6pts) A Hermite (1822-1901) differential equation is

$$y'' - 2xy' + 10y = 0.$$

Use the power series method to solve this differential equation. Find the recurrence relation. Determine two linearly independent solutions in powers of x, showing the values of the coefficients and powers to $n = 8$. One of the linearly independent solutions is a polynomial. Give the degree of this polynomial solution and write this Hermite polynomial. (Slides Intro 18-21)