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

1. (5pts) Consider the 3^{rd} order linear homogeneous ODE given by:

$$t^2y''' - ty'' + 2y' = 0.$$

Use similar techniques for solving the *Cauchy-Euler problem* to solve this problem. Find **3** linearly independent solutions to this problem. How would one establish that these are **3** linearly independent solutions. (Slides 3-10)

2. (5pts) Consider the following ODE:

$$y'' + 16\,y = 32\csc^2(4t).$$

Find the solution to this problem. (Slide 24)

3. (6pts) a. Consider the linear homogeneous ODE given by:

$$ty'' - y' + 4t^3y = 0.$$

Show that $y_1(t) = \cos(t^2)$ and $y_2(t) = \sin(t^2)$ are solutions to this ODE. Find the *Wronskian* of these solutions, $W[y_1, y_2](t)$ and use this to prove that these solutions form a *fundamental set of solutions* to this ODE.

b. Consider the linear nonhomogeneous ODE given by:

$$ty'' - y' + 4t^3y = 8t^3.$$

Use the *Variation of Parameters* method with Part a to solve this problem. (Slide 24)