TOPICS:

GET READY!

Test #1: Guaranteed Problems

1. Solve a linear equation.

   $\rightarrow$ Find homogeneous, particular, and general solutions.

   $\rightarrow$ Use initial data.

   $\rightarrow$ "Analyze" the solution.

2. Work with a model.

   $\rightarrow$ Build the ODE from scratch.

   $\rightarrow$ *Explain why* you do what you do.

3. One "challenging" problem.

(Look at the sample tests on the Web)

Summary: Linear Equations

- General Solution = Homogeneous + Particular Solution
- Find a Homogeneous Solution
  - $\hookrightarrow$ Separate and Integrate
  - $\hookrightarrow$ C.E. for constant coefficients
- Find a Particular Solution
  - $\hookrightarrow$ Vary Your Parameters
  - $\hookrightarrow$ Use the Integrating Factor
  - $\hookrightarrow$ Undetermined Coefficients

Sample Problem:

Analyze following differential equation:

$$y' + 4y = 100t, \; y(0) = 200$$

(a) Find a nontrivial solution to the corresponding homogeneous equation.

(b) Find a particular solution to the original equation.

(c) Give the general solution and find the unique solution satisfying the initial condition.

(d) Describe the behavior of the solution for large values of the independent variable t.

Another Sample Problem:

Solve the following equations:

- $\dfrac{dx}{dt} = -\dfrac{3x}{t}$

- $\dfrac{dx}{dt} = \dfrac{t}{3x}$

A few more:

- $\dfrac{du}{dt} = u - 1$

- $\dfrac{du}{dt} = u^2 - 1$

Another Sample Problem:

Given that

- $L(t)$ solves $y' + t^3 y = 0$ with $L(0) = 5$,

and

- $M(t)$ solves $y' + t^3 y = \cos(2\pi t)$ with $M(0) = -5$,

find the solution, in terms of L and M, for

$$y' + t^3 y = \cos(2\pi t), \quad y(0) = 10 .$$

Remember:

Test #1: Wednesday in Lecture

Closed Book, Closed Notes, Calculator is Okay

Help Session Tuesday Night at 7:00pm

in SL115 (Kinnicutt Hall)

Project Draft will be reviewed in conference

Project Report Due Friday in Lecture