Quiz 1 -- 2.087 Fall 2014

Quiz 1 will take place during recitation time (2:30-3:30PM) on Monday 15 September.

You should budget 85 minutes to complete the quiz (in case we need to allow transit time or allow another group to enter). Quiz 1 will cover the material of Chapter 1 in Strang's Differential Equations and Linear Algebra, especially topic addressed in the lectures on 3,8,and 10 SEP and especially concepts you practiced on Homework #1.

In Quiz 1 you are permitted to use a computer and you are allowed to implement and run MATLAB® code in the quiz to find solutions. You can run other applications as you see fit such as Mathematica. The quiz is intended to be completely "software neutral". You will NOT NEED to interpret MATLAB code or write code, but you can do so if it is helpful for solving a problem.

The quiz is open-book: you may refer to the textbook, to any class materials, to old solutions from past semesters, and to your own notes. In fact, you can refer to any material whatsoever, but you may not communicate with anyone via voice, text, or any other means except with exam proctors to be sure you understand the questions.

The following topics are "fair game" as subject matter for quiz 1.

What is a differential equation?
How do you determine the order of a differential equation?
Categorizing linear versus non-linear equations.
What does superposition enable you to infer about solutions to linear differential equations?
What is a null solution? How do you solve for a null solution?
What is a particular solution?
How can solve initial value problems?
Constructing differential equations based on a description of an engineering system.
What is an equilibrium or steady-state solution?
What does it mean for an equilibrium solution to be stable or unstable?

Finding solutions equations of the form $y' = ay + q(t)$ in general and most especially for the following source functions:
constant source,
unit step function (Heaviside),
delta function (Dirac),
exponential function
sine and cosine

Heaviside step functions and Dirac delta functions (including time delays).
Differentiation and integration of Heaviside step functions and Dirac delta functions.
Representing piecewise functions using Heaviside step functions and Dirac delta functions.

Finding solutions to non-linear, separable first order differential equations.

Identify the key features and properties of important differential equations such as:
The logistic equation, models of growth, and models of decay.

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