**Review for Test 3
Math 230: Differential Equations**

**Format**

* The exam will contain 8 problems (plus or minus 3) and will last 50 minutes.
* It is a paper and pencil exam.
* You will need to show your work.
* You may use a graphing calculator. However, you may not use a symbolic calculator such as the TI-89. If you do not bring an acceptable calculator, you may have to do without.
* You must be able to answer warm up questions and paraphrase mathematical quotes such as those found at:

http://www-groups.dcs.st-andrews.ac.uk/~history/Quotations/Erdos.html

**Basic Content.**

* You are responsible for sections 5.1, 6.1&2 and 7.1-3.
* In addition to the material covered in the class, you are responsible for all of the basic facts you have learned since kindergarten. These include the facts that Barack Obama is the President of the United States of America, , and that 1/0 is undefined.

**In Studying . . .**

* You should be able to recreate every derivation/proof done in class (which isn’t very many).
* You need to know the vocabulary.
* You must recognize the various forms and know the appropriate methods for solving each DE.
* You should be able to solve every example done in class.
* You should be able to solve every homework question.
* Notes: At least some of the DE’s you must solve will be labeled by type.
* Note: I will include a basic integral table with the exam.

**Ideas that may help with test prep …**

* Review the most recent material first.
* Consider recopying your notes.
* Summarize your notes. Make note cards for important formulas and definitions. Set them aside once the definitions are known.
* Rework examples from class and homework questions (in this order).
* Look to the review exercises for additional practice.
* Practice like you will play – do you know the material without your notes when the clock is running?
* Study with a friend to have more fun.
* Look to online resources such as YouTube and the Khan Academy to fill in holes.
* Show up at least five minutes early for the exam.

**A Summary of the Topics (not necessarily exhaustive)**

* 5.1.1: Spring/Mass Systems: Free Undamped Motion
	+ Use Hooke’s Law to determine spring constants
	+ Use Hooke’s Law and Newton’s Second Law to set up and solve the differential equation for undamped spring motion
	+ Solve IVPs related to springs
	+ Find the amplitude and phase angle
* 6.1: Review of Power Series
	+ Know the vocabulary of power series
	+ Determine the radius of convergence (not the IOC) using the ratio test
	+ Combine power series into a single series (addition/subtraction, but not multiplication/division). Your answers will be in sigma () notation
	+ Solve linear DEs using power series
* 6.2: Solutions about Ordinary Points
	+ What is an ordinary point?
	+ Finding the minimum radius of convergence
	+ Solve second order DEs with power series
		- Two term recurrence
		- Three term recurrence
	+ You will not need to write your results in sigma () notation. You will just be asked to write the first 4 or 5 terms and then the appropriate “…”
	+ You will not need to solve a DE with non-polynomial coefficients
* 7.1: Definition of the Laplace Transform
	+ Know and be able to apply the definition of the Laplace Transform
	+ Understand and apply the property of linearity as it applies to the Laplace Transform
	+ You do not need to know about exponential order or piecewise continuity
	+ You do need to be able to work with simple piecewise defined functions
	+ You do need to memorize the five (5) basic Laplace Transform identities (below)

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* 7.2: Inverse transforms and transforms of derivatives
	+ Know the inverse transforms corresponding to Theorem 7.1.1 (above)
	+ Perform partial fractions decomposition
	+ Solve IVPs using Laplace Transforms
* 7.3.1: Translation on the *s*-Axis
	+ Know how a horizontal shift in *s* impacts the function on which a Laplace Transform is performed.
	+ Be able to find the corresponding partial fraction decompositions
	+ Recognize and marvel at the power of the Laplace Transform when solving IVPs