MATH 251 SPRING SEMESTER 2012
Exam II study guide

Exam Date/Time: Tuesday, April 3, 6:30 to 7:45 pm
Format: 100 points in 12 questions (4 x multiple-choice, and 8 x partial-credit / short-answer)
Location: 102 Forum (sections 2, 3, 5); 105 Forum (sections 9, 11, 12); 108 Forum (sections 6, 7, 8); 111 Forum (sections 1, 4, 10)

A table of Laplace transforms (a copy of table 6.2.1 from the textbook) will be provided during the exam.

Topics to study

1. Second order nonhomogeneous linear equations: Method of Undetermined Coefficients
2. Mechanical vibrations: damped and undamped free vibrations, damping classification, natural frequency/period, quasi-frequency/period, undamped forced vibration, and resonance.
3. Higher order homogeneous linear equations with constant coefficients
4. Definition (by an integral) and properties of the Laplace transform.
5. Solving initial value problems using the Laplace transform method.
6. Step functions, writing a piecewise continuous function in terms of step functions; Laplace transforms of step and piecewise continuous functions.
7. Differential equations with piecewise continuous and/or impulsive forcing functions.
8. Writing an n-th order linear equation into an n x n system.
9. The Eigenvalues/vectors method of solving 2 x 2 systems of homogeneous linear equations
10. Phase portrait: type and stability of a critical point.
11. Nonlinear system: finding critical points, type and stability of its critical points

Note: The predator-prey equations are not covered on this exam.

Comments: Students should understand how to solve linear differential equations using the characteristic equation and the Laplace transform; over-, under-, and critical damping; how translations work with the Laplace transform, and to transform piecewise continuous functions; solving systems of linear equations using Eigenvalues and Eigenvectors; the type and stability classifications of critical points (know the 6 types and 3 stabilities); and how to linearize a nonlinear system about one of its critical points.