MA 536 STUDY GUIDE FOR MIDTERM EXAM

Midterm Exam will be on **Monday, March 17.**
No books or notes will be allowed on the test.

The exam will cover Chapters 7, 8, 9.

You will be asked to give definitions, state theorems, give proofs of some of the theorems, and solve problems. This may include T/F questions where you need to give a proof or a counterexample. Make sure that you know how to solve all Hw problems.

Here is a list of definitions and theorems that you need to know.

Definitions.

- Pointwise convergence of a sequence of functions
- Uniform convergence of a sequence of functions
- Pointwise convergence of a series of functions
- Uniform convergence of a series of functions
- The supremum norm
- Equicontinuous family of functions

- Power series
- Taylor polynomials and Taylor series
- e^x as a power series
- Fourier series
- Orthogonal / orthonormal system
- L^2-norm

- Linear transformation
- Norm of a linear transformation
- Differentiable function $\mathbb{R}^n \to \mathbb{R}^m$ and its derivative
- Partial derivatives and gradient
- Directional derivatives
- Continuously differentiable function
- Contraction

Theorems. You need to know the statements of the theorems below.
You should also be able to prove the results marked by *.

- Chapter 7: Sequences and series of functions.

  7.8*, 7.10, 7.12*, 7.15, 7.16, 7.17; three theorems for series of functions: continuity of the sum, integration, and differentiation; 7.24*, 7.25 (a*, b), 7.26.

- Chapter 8: Some special functions.

  8.1* and Corollary, 8.11*, 8.12*;

  (*) If $\{\phi_n\}$ is a complete ortnonormal system in $L^2[a,b]$ then for any $f \in L^2[a,b]$ the Fourier series of f relative to $\{\phi_n\}$ converges to f in the L^2-norm.

  If f is a continuously differentiable 2π-periodic function then its Fourier series converges to f uniformly.

- Chapter 9: Functions of several variables.

  9.5, 9,7*, 9.8, 9.12*, 9.15, 9.17, 5.19, 9.19*, 9.21, 9.23*, 9.24, 9.27, 9.28.