List of Theorems for Mth 436 Final

Parts of the proofs of the following theorems could appear on the final exam.

Analysis

1. Theorem 5.7
   If f is Riemann integrable on $[a, b]$, then f is bounded on $[a, b]$.

2. Theorem 5.8
   Cauchy criterion for Riemann integrability.

3. Theorem 5.11
   If f is continuous on $[a, b]$, then f is Riemann integrable on $[a, b]$.

4. Theorem 5.17
   The Fundamantal Theorem of Calculus

5. Theorems 5.23, 5.24
   Mean Value and Generalized Mean Value Theorems for Integrals

6. Theorem 6.12
   The Ratio Test

7. Theorem 6.13
   The Root Test

8. Theorem 7.7
   Weierstraß M-Test

9. Theorem 7.8, Corollary 7.9
   Uniform limits of continuous functions are continuous.

10. Theorem 7.11
    Convergence of integrals for uniformly convergent sequences of Riemann integrable functions.

Topology

1. Definition and Theorem V.11
   Construction of the quotient topology.

2. Theorem VI.4
   The topology generated by a basis is precisely the collection of unions of sets of the basis.

3. Theorem VII.9
   $\partial A = \overline{A} \setminus A^{\circ}$ (given $\partial A := \overline{A} \cap \overline{X \setminus A}$),
   $\overline{A} = A^{\circ} \cup \partial A$, this union being disjoint.

4. Theorem XIII.1
   A metric space is normal.

5. Theorem IX.8
   $(X, \mathcal{S})$, $(Y, \mathcal{T})$ topological spaces with X compact, Y Hausdorff and $f : X \mapsto Y$ continuous. If $K \subset X$ is compact, then so is $f(K)$.

6. Theorem XI.10
   $(X, \mathcal{S})$, $(Y, \mathcal{T})$ topological spaces and $f : X \mapsto Y$ continuous. If $A \subset X$ is connected, then so is $f(A)$.

7. Theorem XII.6
   If $(X, \mathcal{T})$ is a connected and locally path connected topological space, then X is path connected.