As promised, this is an itemized list of topics we've covered in Math 338 since the second midterm exam. As I stated in class, the final exam will be cumulative; however, its focus will be primarily on the things we've covered since the last midterm exam. Thus, when studying for your final, please concatenate this list of topics with the preview two to form a complete list of topics for the final exam. As before, please note that I consider the homework exercises and the everything I've covered in lecture to be the best source of practice (problems, proofs, etc). If you know how to approach each problem/exercise/proof, are able to work quickly and accurately, and understand the theory and methodology by which you have obtained a solution/proof, you should perform well on the exam.

Definitions:

The following list enumerates all the definitions you need to know (and by heart). In particular, you should make sure to know all quantifiers involved in the definitions and the order in which they appear. Also, for each definition, you should be able to come up with several examples satisfying the definition (and hopefully things that don't satisfy the definition).

1. You should know the definition of local maximum (Definition 5.7 in Rudin).
2. You should know the definition of Lipshitsz and Hölder continuous function.
3. You should know what it means for a subset $A \subseteq \mathbb{R}^d$ to be convex and, further, what it means to be uniformly quasi-convex.
4. You should know all of the notations defined/given in Subsection 5.3.1 of the course notes. Of course, you should be able to produce examples of functions in each "space".
5. You should know the definition of partition P of an interval $I \subseteq \mathbb{R}$.
6. For a bounded real-valued function f on an interval I and a partition P of I, you should know that $U(f, P)$ and $L(f, P)$ (the upper and lower Darboux sums) are.
7. For a bounded real-valued function f on an interval I, you should know what the upper and lower Darboux sums/integrals $U(f)$ and $L(f)$ are.
8. You should know that it means for a bounded real-valued function f on $I = [a, b]$ to be Riemann integrable (or, equivalently) Riemann-Darboux integrable. This is definition 6.6.
9. You should know the definition of Riemann sum, i.e., this is Definition 6.11.
10. You should know the convention of the Riemann-Darboux integral as a signed integral.
11. You should know what it means for a bounded complex-valued function to be Riemann-Darboux integrable.
12. You should know Definition 6.28 and why it makes sense to call it an average.
13. On a set X, you should know what it means for a sequence of complex-valued functions $\{f_n\}$ to converge pointwise to another function f on X. This is definition 7.1.
14. On a set x, you should know what it means for a sequence of complex-valued functions $\{f_n\}$ to converge uniformly to another function f on X. You should also know how this differs from pointwise convergence. This is definition 7.2.
15. On a set X, you should know what it means for a sequence of complex-valued functions to be "uniformly Cauchy" on X.
16. You should know Definition 7.5 and, in particular, what it means for a series of functions to converge pointwise and uniformly on a set X.

Results (Theorems, propositions, lemmas, corollaries):

For the following results, unless otherwise mentioned, you should know the statement of the result precisely and have a really good idea of how they are proved – ideally, you should be able to follow/reproduce the proof.

1. You should know the result that says derivatives vanish at local extrema, Theorem 5.8 of Rudin.
2. You should know Cauchy's mean value theorem, Theorem 5.9 in Rudin.
3. You should know its corollary, Theorem 5.10 of Rudin, which is usually called the mean value theorem.
4. You should know Theorem 5.12 and its corollary of Rudin (concerning the types of discontinuities that a differentiable function can have).
5. You should know Theorem 5.13 of Rudin.
6. You should know Taylor's theorem, Theorem 5.15 of Rudin.
7. You should know EVERY result in the course notes up to the end of Section 7.2 and how to prove the result (unless mentioned otherwise). This includes
   - Proposition 5.1
   - Proposition 5.2
   - Lemma 6.3
   - Lemma 6.4
   - Proposition 6.5
   - Theorem 6.7 (Riemann's condition)
   - Theorem 6.8 (You should understand this proof, but I certainly won't ask you to prove something this difficult on the final).
   - Corollary 6.9
   - Corollary 6.10
   - Theorem 6.12 (You should understand this proof, but I certainly won't ask you to prove something this difficult on the final).
   - Corollary 6.13
   - Theorem 6.14
   - Proposition 6.15
   - Proposition 6.16
   - Theorem 6.20
   - Theorem 6.21
   - Theorem 6.22
   - Lemma 6.23
   - Theorem 6.24 (and, you should also know the proof given in Exercise 6.8)
   - Theorem 6.25
   - Corollary 6.26
   - Proposition 6.27 (You should know the result and the proof in the notes; you don't need to know the proof in the context of the Riemann-Steiltjes integral).
   - Theorem 6.29
   - Theorem 7.3

- Corollary 7.4
- Corollary 7.6
- Theorem 7.7
- Theorem 7.8
- Theorem 7.9
- Corollary 7.10
- Corollary 7.11
- Theorem 7.12 (You don't need to know its proof but, if you're curious, this appears as Theorem 7.17 in Rudin).
- Theorem 7.13
- You should know the approximation theorems of Weierstrass and Stone (Theorems 7.14 and Theorem 7.15). You do not need to know their proofs.

Things not to worry about:

I've been explicit about what you need (and what you don't need) to know above. I think the only thing that is worth mentioning here is that you do not need to know anything in the course notes after the end of Section 7.2. I may ask you to develop some of this stuff on the final, but it will be self contained and you need not worry about studying it now.