Format and topics
Exam 2, Math 108

General information. Exam 2 will be a timed test of 75 minutes, covering Chapters 10–16 of the Yellow Book and Parts I–III (Sections 1–16) of the proof notes. No books, notes, calculators, etc., are allowed. Most of the exam will rely on understanding the problem sets and the definitions and theorems that lie behind them. If you can do all of the homework, and you know and understand all of the definitions and the statements of all of the theorems we've studied, you should be in good shape.

You should not spend time memorizing proofs of theorems from the book, though understanding those proofs does help you understand the theorems. On the other hand, you should defintely spend time memorizing the *statements* of the important theorems in the text.

Types of questions. Exam 2 will feature the same types of questions as Exam 1, including statements of definitions and theorems, proofs, computations, and true/false with justification. Exam 2 may also feature another kind of question that was on Exam 1, namely:

Proof outlines. In these questions, you will be asked to outline the proof of a theorem, and not finish the proof. In such a question, you need to state the assumptions and conclusions of the theorem clearly and split the proof into parts if the proof has an obvious Part 1/Part 2 structure (e.g., if the theorem is an "if and only if" statement). Furthermore, if the conclusion of the theorem involves a "there exists" statement, you should indicate the point where you have to construct or choose a corresponding object (i.e., "Let $p =$?").

Definitions. The most important definitions we have covered in the Yellow Book are:

Ch. 10	reflexive relation	symmetric relation
	transitive relation	equivalence relation
	equivalence class	
Ch. 11	partition	
Ch. 12	bounded above	bounded below
	upper bound	lower bound
	bounded	maximum
	minimum	supremum
	least upper bound	infimum
	greatest lower bound	
Ch. 13	function	map, mapping
	well-defined	domain
	codomain	range
Ch. 14	one-to-one	onto
	injective	surjective
	bijective	injection
	surjection	bijection
Ch. 15	composite function	composition
	identity function	inverse
Proof notes 16	inverse	invertible
Ch. 16	image	inverse image

You do not need to know any definitions from the *Concepts* book.

Examples. You will also need to be familiar with the key properties of the main examples we have discussed. The most important examples we have seen are:

Ch. 10 Example 10.2.
Ch. 12 Examples 12.2, 12.7.
Ch. 13 Examples 13.4, 13.7.
Ch. 14 Examples 14.2, 14.3, 14.6.

Ch. 15 Examples 15.1, 15.2.
Ch. 16 Example 16.8.

You should also be familiar with all of the examples from the Exercises from Ch. 10–16, and you should be familiar with the examples from PS03–05.

Theorems, results, algorithms, axioms. The most important theorems, results, algorithms, and axioms we have covered are listed below. You should understand all of these results, and you should be able to state any theorem clearly and precisely. You don't have to memorize theorems by number or page number; however, you should be able to state a theorem, given a reasonable identification of the theorem (either a name or a vague description).

Ch. 10 Example 10.2.
Ch. 11 Partitions come from equivalence relations, and vice-versa (Thm. 11.4).
Ch. 12 Completeness axiom of **R**; Archimedean Property of **R** (either Thm. 12.9 or Cor. 12.10); Well-ordering principle of **N**; Density of the rationals in the reals (Thm. 12.11).
Ch. 15 Facts about inverses (Thm. 15.4); $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$; Composition of one-to-one, onto, and converse (Thms. 15.7, 15.8).
Proofs handout The inverse theorem.
Ch. 16 Properties of images and inverse images (Thms. 16.6–16.7).

Other. Please be familiar with the "techniques of proof" in the proof notes, Sects. 1–16.
Not on exam. The material in *Concepts* will not be covered on Exam 2.
Good luck.