Review Guide: Chapter 4

Definitions

- Why is the phrase "if, and only if" used in a definition? *(p. 147)*
- How are the following terms defined?
  - even integer *(p. 147)*
  - odd integer *(p. 147)*
  - prime number *(p. 148)*
  - composite number *(p. 148)*
  - rational number *(p. 163)*
  - divisibility of one integer by another *(p. 170)*
  - n *div* d and n *mod* d *(p. 181)*
  - the floor of a real number *(p. 191)*
  - the ceiling of a real number *(p. 191)*
  - greatest common divisor of two integers *(p. 220)*

Proving an Existential Statement/Disproving a Universal Statement

- How do you determine the truth of an existential statement? *(p. 148)*
- What does it mean to "disprove" a statement? *(p. 149)*
- What is disproof by counterexample? *(p. 149)*
- How do you establish the falsity of a universal statement? *(p. 149)*

Proving a Universal Statement/Disproving an Existential Statement

- If a universal statement is defined over a small, finite domain, how do you use the method of exhaustion to prove that it is true? *(p. 150)*
- What is the method of generalizing from the generic particular? *(p. 151)*
- If you use the method of direct proof to prove a statement of the form "$\forall x$, if $P(x)$ then $Q(x)$", what do you suppose and what do you have to show? *(p. 152)*
- What are the guidelines for writing proofs of universal statements? *(pp. 155-156)*
- What are some common mistakes people make when writing mathematical proofs? *(pp. 157-158)*
- How do you disprove an existential statement? *(p. 159)*
- What is the method of proof by division into cases? *(p. 184)*
- What is the triangle inequality? *(p. 188)*
- If you use the method of proof by contradiction to prove a statement, what do you suppose and what do you have to show? *(p. 198)*
- If you use the method of proof by contraposition to prove a statement of the form "$\forall x$, if $P(x)$ then $Q(x)$", what do you suppose and what do you have to show? *(p. 202)*
- Are you able to use the various methods of proof and disproof to establish the truth or falsity of statements about odd and even integers *(pp. 154,199)*, prime numbers *(pp. 159,210)*, rational and irrational numbers *(pp. 165,166,201,204,208,209)*, divisibility of integers *(pp. 171,173,174,175,184,186,202,203)*, absolute value *(pp. 187-188)*, and the floor and ceiling of a real number *(pp. 194-196)*?

Some Important Theorems and Algorithms

- What is the transitivity of divisibility theorem? *(p. 173)*

- What is the theorem about divisibility by a prime number? *(p. 174)*
- What is the unique factorization of integers theorem? (This theorem is also called the fundamental theorem of arithmetic.) *(p. 176)*
- What is the quotient-remainder theorem? Can you apply it to specific situations? *(p. 180)*
- What is the theorem about the irrationality of the square root of 2? Can you prove this theorem? *(p. 208)*
- What is the theorem about the infinitude of the prime numbers? Can you prove this theorem? *(p. 210)*
- What is the division algorithm ? *(p. 219)*
- What is the Euclidean algorithm? *(pp. 220,224)*
- How do you use the Euclidean algorithm to compute the greatest common divisor of two positive integers? *(p. 223)*

Notation for Algorithms

- How is an assignment statement executed? *(p. 214)*
- How is an **if-then** statement executed? *(p. 215)*
- How is an **if-then-else** statement executed? *(p. 215)*
- How are the statements **do** and **end do** used in an algorithm? *(p. 215)*
- How is a **while** loop executed? *(p. 216)*
- How is a **for-next** loop executed? *(p. 217)*
- How do you construct a trace table for a segment of an algorithm?*(pp. 217,219)*