Sample Questions for test 2, but please look at the notes and homework as this is only a sample (not a review)

I. Methods of Proofs

1. Prove
   (a) Indirectly if *3n+2* is odd, then *n* is odd.

   (b) By contradiction that if *3n+2* is odd, then *n* is odd.

2. Prove that the difference of two odd integers is an even integer.

II. Functions

1) True or False?
   Let ***R*** be the set of real numbers, and $\boldsymbol{R}^+$ be the set of positive real numbers. Let ***Z*** be the set of integers, and $\boldsymbol{Z}^+$ be the set of positive integers. Let ***E*** be the set of even integers, and $\boldsymbol{E}^+$ be the set of positive even integers. Let ***S*** be the set of all finite length bit strings.

   i. **True or False:** Let $f: R \to R$, where $f(x) = x^2$. This assignment of the integers to the integers is a function.
   ii. **True or False:** Let $f: Z^+ \to Z^+$, where $f(x) = x^2$. This assignment of positive integers to the positive integers is a one-to-one function.
   iii. **True or False:** Let $f: S \to E \cup \{1\}$, where if *x* is a bit string of length *n* such that $f(x) = 2^n$. This function is one-to-one.
   iv. **True or False:** Let $f: S \to E^+ \cup \{1\}$, where if *x* is a bit string of length *n* such that $f(x) = 2^n$. This function is onto $E^+ \cup \{1\}$.
   v. **True or False:** Let $f: R^+ \to Z$, where $f(x) = \left\lfloor \frac{x}{2} \right\rfloor$. This function is one-to-one.
   vi. **True or False:** Sunday is the 948^{th} day from Thursday.

2) Suppose $f: R \to R$ that has the rule *f(x) = 5n -2*.
   (a) **Prove** that this function is one-to-one.

   (b) **Prove** that this function is onto *R*.

III. Sets

1. Suppose $A = \{a, b, c\}$. Mark each of the following TRUE or FALSE.
   (a) $\{b,c\} \in P(A)$
   (b) $\{\varnothing\} \in P(A)$
   (c) $\varnothing \in P(A)$
   (d) $\{b,c\} \subseteq P(A)$
   (e) $|P(A)| = 9$
   (f) $A \oplus (B \oplus C) = (A \oplus B) \oplus C$

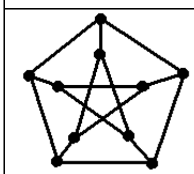
2. Prove that for any set A, $\varnothing \subseteq A$.
3. Let $|U| = 200$, $|A| = 97$, $|B| = 135$, and $|A \cap B| = 32$. Find the cardinality of $|A \cup B|$.
4. Prove that $|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|$.

IV. Set Operations

1. Determine the union and intersection.
   (b) $\bigcap_{i=1}^{n} \{i, i+1, \ldots, n\}$
   (c) $\bigcup_{i=1}^{n} \{i, i+1, \ldots, n\}$
2. Disprove $A \times B = B \times A$.

3. Let A = { 1, 2, 3, 4 }.
   (a) $|P(A)| =$
   (b) $|A \times A| =$
   (c) $|P(A \times A)| =$
   (d) $|P(A) \times P(A)| =$
   (e) $|A \times A \times A| =$

4. **Prove** or **disprove** that $\overline{(A - B)} = \overline{A} \cup B$ whenever A and B are sets.
5. Prove (no Venn Diagram or membership table proofs for this): $A - (B \cap C) = (A - B) \cup (A - C)$.

	List Degree sequence	Num. of edges.	Max. degree	Max. degree	Sum of degrees	True or False The graph has P_3 as a subgraph	True or False The graph has P_3 as an induced subgraph
K_5							
$\overline{K_{10}}$							
P_7							
							

Please see notes and homework on all sections, since this is only a small sample.