MATH 052: FUNDAMENTALS OF MATHEMATICS
REVIEW, EXAM #1

Problem 1. Give the truth table for $Q \wedge (P \vee (\sim Q))$.

Problem 2. I got an A+ in every nuclear physics I took. What is the easiest way for this statement to be true?

Problem 3. List the elements of the sets
$$A = \{n \in \mathbb{N} : n^3 < 100\} \text{ and } B = \{x \in \mathbb{R} : x^2 + 1 = 0\}.$$

Problem 4. Let $A = \{\emptyset, \{\emptyset\}, \{\{\emptyset\}\}\}$.
  (a) Determine which of the following are elements of A: $\emptyset$, $\{\emptyset\}$, $\{\emptyset, \{\emptyset\}\}$. Which are subsets of A?
  (b) How many elements are in A?
  (c) Determine the sets $\{\emptyset\} \cap A$ and $\emptyset \cup A$ and $A \setminus \{\emptyset\}$.

Problem 5. Give an example of a partition of $\mathbb{Z}$ into four subsets.

Problem 6. Consider the statement

  "If a series converges, then its terms go to zero."

This statement is in the form $P \Rightarrow Q$. Write each of the corresponding statements and determine their truth value.
  (a) $Q \Rightarrow P$.
  (b) $\sim Q \Rightarrow \sim P$.
  (c) $\sim P \Rightarrow \sim Q$.
  (d) $P \Leftrightarrow Q$.
  (e) $\sim (P \Rightarrow Q)$.
Which of these are logically equivalent to the original statement?

Problem 7. Is the following sentence true or false? "This sentence is false."