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CS 3800, Spring 2010 (Instructor: Clinger)
Homework 0
Assigned:  Tuesday, 12 January 2010
Due:       Friday, 15 January 2010
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Good students should get at least 25 of the 30 possible points.

1. [5 pts] For each of the following set operations, specify the result by listing its elements inside curly braces.

   (a) $\{1,2\} \cup \{1,3,4\} =$
   (b) $\{1,2\} \cap \{1,3,4\} =$
   (c) $\{1,2\} - \{1,3,4\} =$
   (d) $\{1,2,3\} - \{2,4\} =$
   (e) $\{1,2,3\} \times \{3,4\} =$

2. [4 pts] Write out each of the following power sets by listing their elements inside curly braces.

   (a) $\mathcal{P}(\emptyset) =$
   (b) $\mathcal{P}(\{7\}) =$
   (c) $\mathcal{P}(\{7,8\}) =$
   (d) $\mathcal{P}(\{3,4,5\}) =$

3. [6 pts] If S is any set, then we use the notation $|S|$ to indicate the number of elements in S. Suppose A, B, and C are sets with $|A| = 5$, $|B| = 3$, and $|C| = 7$. Compute the number of elements in each of the following sets.

   (a) $|A \times A| =$
   (b) $|B \times C| =$
   (c) $|A \times B \times C| =$
   (d) $|\mathcal{P}(A)| =$
   (e) $|\mathcal{P}(B)| =$
   (f) $|\mathcal{P}(A \times B)| =$

4. [5 pts] For any $n \in \mathcal{N}$, we say that n is odd if and only if there exists $m \in \mathcal{N}$ such that $n = 2m + 1$. From this definition, give a rigorous proof that the sum of two odd numbers is even.

5. [5 pts] Give a rigorous proof that the product of two odd numbers is odd.

6. [5 pts] Prove that there is no largest odd number. (In other words, prove that there is no odd $l \in \mathcal{N}$ such that $l \geq k$ for all odd $k \in \mathcal{N}$. Hint: for all $n \in \mathcal{N}$, $n + 1 > n$.)