Name: _____

Directions: Show all work. No credit for answers without work.

1. **[2 points]** Find $\mathcal{P}(\{\varnothing\})$.

2. **[2 parts, 1 point each]** Let $A = \{(1,2), (5,\{6,7\},8), 9, \{10,11\}\}$ and let $B = \{(2,1), 9, 10, 11, \{11,10\}\}$.

   (a) Determine $|A|$ and $|B|$.

   (b) Determine $A \cap B$.

3. **[2 parts, 1 point each]** True or false (write the whole word):

   (a) $(5,\{3,1\},8) = (5,\{1,3\},8)$

   (b) $\{5,\{3,1\},8\} = \{5,\{1,3\},8\}$

4. Let $U = \{x \in \mathbb{Z} \mid 1 \leq x \leq 3\} \cup \{x \in \mathbb{Z} \mid -3 \leq x \leq -1\}$.

   (a) **[1 point]** List the elements of U. What is $|U|$?

   (b) **[1 point]** Let A be the set of all subsets of U that do not contain a pair of integers with sum zero. For example, $\{-2, 1\}$ and $\varnothing$ are members of A but $\{-1, 1, 2\} \notin A$ because $-1 + 1 = 0$. Give an example of a set $S \in A$ such that $|S| = 3$.

   (c) **[2 points]** Let $B = \{(x_1, x_2, x_3) \mid x_i \in \{-, 0, +\} \text{ for each } i\}$. For example, $(0, 0, 0)$, $(+, 0, +)$ and $(-, +, +)$ are all elements of B. (1) Describe a bijective correspondence between A and B. (2) What is $|A|$?