CSC336: John Connor — Quiz 1 **Answer Key**

1. (10 points) What is the cardinality of the set $\{1, \emptyset, \{1, \emptyset\}\} \cup \emptyset$?

   Solution: $|\{1, \emptyset, \{1, \emptyset\}\} \cup \emptyset| = |\{1, \emptyset, \{1, \emptyset\}| + |\emptyset| = 3 + 0 = 3$

2. (10 points) What is $\{0, 1\} \cup \{1, \{2, 3\}\} \cup \{1, 2, 3, 0\}$?

   Solution: $\{0, 1, 2, 3, \{2, 3\}\}$

3. (10 points) What is the cardinality of the set $\{(0, 1, 2), (1, 2, 0), (0, 1, 2)\}$?

   Solution: 2 (note that (0, 1, 2) appears twice).

4. (10 points) If X, Y are sets and $|X| = n$ and $|Y| = m$, then what can be said about $|X \cup Y|$ and $|X \cap Y|$?

   Solution:
   The cardinality of the union is bounded above by $n + m$ and below by $\max(n, m)$.
   The cardinality of the intersection is bounded above by $\min(n, m)$ and below by $|X \backslash (X \backslash Y)|$.

5. (20 points) True or false: $(A \cup B) \backslash B = A$?

   Solution: No way! A counter example: $\{0, 1, 2\} \cup \{1, 3\} \backslash \{1, 3\} = \{0, 2\}$

6. (20 points) What is $|(\{0, 1, 2\} \times \{3, 4\}) \cup \mathcal{P}(\{5, 6, 7\})|$?

   Solution: We know that the cardinality of the product must be 6, and that the intersection with the powerset is empty (since the product contains only tuples and the powerset contains no tuples), and so we have: $6 + 2^3 = 14$.