CSIT504 Module 2 Homework

1. (Problem 9 on page 125 from Rosen) Determine whether each of these statements is true or false.

   - $0 \in \phi$
   - $\phi \in \{0\}$
   - $\{0\} \subset \phi$
   - $\phi \subset \{0\}$
   - $\{0\} \in \{0\}$
   - $\{0\} \subset \{0\}$
   - $\{\phi\} \subseteq \{\phi\}$

2. (Problem 11 on page 125 from Rosen) Determine whether each of these statements is true or false.

   - $x \in \{x\}$
   - $\{x\} \subseteq \{x\}$
   - $\{x\} \in \{x\}$
   - $\{x\} \in \{\{x\}\}$
   - $\phi \subseteq \{x\}$
   - $\phi \in \{x\}$

3. (Problem 19 on page 126 from Rosen) Determine the cardinality of the following sets.

   - $\{a\}$
   - $\{\{a\}\}$
   - $\{a, \{a\}\}$
   - $\{a, \{a\}, \{a, \{a\}\}\}$

4. (Problem 23 on page 126 from Rosen) How many elements does each of these sets have where a and b are distinct elements.

   a) $\mathcal{P}(\{a, b, \{a, b\}\})$
   b) $\mathcal{P}(\{\emptyset, a, \{a\}, \{\{a\}\}\})$
   c) $\mathcal{P}(\mathcal{P}(\emptyset))$

5. (Problem 3 on page 136 from Rosen) Let $A = \{1, 2, 3, 4, 5\}$ and $B = \{0, 3, 6\}$. Determine

   - $A \cup B$
   - $A \cap B$

- $A - \boldsymbol{B}$
- $\boldsymbol{B} - A$

6. (Problem 27 on page 136 from Rosen) Draw the Venn diagrams for each of the following, assuming that A, $\boldsymbol{B}$, and C are sets.
   - $A \cap (\boldsymbol{B} - C)$.
   - $(A \cap \boldsymbol{B}) \cup (A \cap C)$.
   - $(A \cap \bar{\boldsymbol{B}}) \cup (A \cap \bar{C})$.
7. (Problem 29 on page 136 from Rosen) What can you say about the sets A and $\boldsymbol{B}$ if we know that
   - $A \cup \boldsymbol{B} = A$?
   - $A \cap \boldsymbol{B} = A$?
   - $A - \boldsymbol{B} = A$?
   - $A \cap \boldsymbol{B} = \boldsymbol{B} \cap A$.
   - $A - \boldsymbol{B} = \boldsymbol{B} - A$?