Name: _____

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

1. **[6 parts, 1 point each]** Let $A = \{3, 4, 1, \{2, 1\}\}$, $B = \{\varnothing, \{1\}, \{2\}\}$, and $C = \{1, 2\}$.

   (a) Determine the sizes of $A$, $B$, and $C$.

   (b) Determine the set $A - C$.

   (c) True or False (write entire word): $\{1, 2\} \in A$.

   (d) True or False (write entire word): $\{\varnothing\} \in B$.

   (e) True or False (write entire word): $\{1\} \in \mathcal{P}(B)$.

   (f) True or False (write entire word): $B \subseteq \mathcal{P}(C)$

2. [**2 points**] Suppose that $A \subseteq B$, meaning that $A$ is a subset of $B$. Describe the relationship between $\mathcal{P}(B - A)$ and $\mathcal{P}(B) - \mathcal{P}(A)$. Are these sets always equal? Is one always a subset of the other? Explain your answer. Hint: it may help to draw a picture.

3. [**2 points**] Give an example of a set $A$ of size at least 2 such that $A \subseteq \mathcal{P}(A)$. (Partial credit for giving a smaller set $A$ that satisfies $A \subseteq \mathcal{P}(A)$.)