Name: Solutions

1. If $A = \{1, 2, 4\}$ and $B = \{2, 3, 5\}$, compute

[1] (a) $A \cup B = \{1, 2, 3, 4, 5\}$

[1] (b) $A \cap B = \{2\}$

[1] (c) $A \setminus B = \{1, 4\}$

2. Let A, B, and C be subsets of some universal set U. Prove that if $A \subseteq B$, then
[4] $A \cap C \subseteq B \cap C$.

Proof: Suppose that $A \subseteq B$, and let $x \in A \cap C$. Since $x \in A \cap C$, $x \in A$ and $x \in C$. Since $x \in A$ and $A \subseteq B$, $x \in B$. Thus $x \in B$ and $x \in C$, which shows that $x \in B \cap C$. Thus, it follows that $A \cap C \subseteq B \cap C$.

[3] 3. Is it true that if $A \cap C \subseteq B \cap C$, then $A \subseteq B$? Give a suitable proof or counterexample.

This is false. For example, consider $A = \{1, 2\}$, $B = \{2, 3\}$, and $C = \{2\}$. Then $A \nsubseteq B$, since $1 \in A$ but $1 \notin B$, but $A \cap C = \{2\}$ and $B \cap C = \{2\}$, and $\{2\} \subseteq \{2\}$.

Total: 10 points