Name: Solutions

1. Let T, A, and B be subsets of some universal set U.
[5] Prove that if $T \subseteq A$, then $T \times B \subseteq A \times B$.

   Proof: Suppose that $T \subseteq A$. We want to show that $T \times B \subseteq A \times B$. Thus, suppose that $(a, b) \in T \times B$, where $a \in T$ and $b \in B$. Since $a \in T$ and $T \subseteq A$, we must have $a \in A$. But then $a \in A$ and $b \in B$, which implies that $(a, b) \in A \times B$.

   Since $(a, b) \in T \times B$ was aribtrary, it follows that $T \times B \subseteq A \times B$.

2. For each natural number n, let $A_n = \{n, n+1, n+2, n+3\}$. Determine the elements of
[5] the set $\bigcup_{i=2}^{4} A_i$.

   We need to compute $\bigcup_{i=2}^{4} A_i = A_2 \cup A_3 \cup A_4$. Since

$$
\begin{aligned}
A_2 &= \{2, 3, 4, 5\} \\
A_3 &= \{3, 4, 5, 6\} \\
A_4 &= \{4, 5, 6, 7\}
\end{aligned}
$$

   we see that $\bigcup_{i=2}^{4} A_i = \{2, 3, 4, 5, 6, 7\}$.

Total: 10 points