Name (please print)____

Note: Show your work on all problems. Please do not include any obvious algebraic details. A total of 20 points is possible.

1. `[4 Points]` Using **only** the Axioms of probability and the finite additivity property show that for any two events A and B if $A \subset B$, then $P(A) \leq P(B)$. State the properties that you use at each step. You don't need to prove set-theoretic properties. Note: You will not get any credit if you use other theorems on properties of $P(\cdot)$.

2. `[5 Points]` Suppose that $\mathcal{B}$ is a Borel field. Let $A_1 \in \mathcal{B}$ and $A_2 \in \mathcal{B}$. Use only the three properties of a Borel field, given in Definition 1.2.1 of your text (page 6), to show that $A_1 \cap A_2 \in \mathcal{B}$. Note you are only allowed to use set theory and the three properties in your proof. Cite the properties that you use at each step of your proof.

3. `[5 Points]` There are four children in a family. Their mom purchases six different gifts and decides to divide the gifts randomly between the children. Assuming that a child can receive no gift, or multiple gifts (up to all six gifts), What is the probability that each child receives at least one gift?

4. `[3 Points]` In the previous problem, thinking only about the number of gifts received by each child, how many different possibilities are there? [for example, (3, 1, 1, 1) is one possibility where child 1 receives 3 gifts and each of the other children receive one; or (1, 3, 1, 1) is another possibility where the second child receives three gifts and the remaining children receive one; yet (0, 0, 6, 0) is another choice where the third child receives all the gifts. I have given examples of three possibilities. The problem is asking for the total number of such possibilities.]

5. `[3 Points]` Suppose that we have collection of six numbers., $\{1, 2, 7, 8, 14, 20\}$. If we draw six numbers with replacement from this set, what is the probability that the mean of the six numbers drawn is 11?