Math 149A HW 1 (Part 1)
Due Wednesday, October 3^{rd}.

1. (Based on 1.2.3 from the text): Let C be the collection of all possible arrangements of the letters m, a, r, and y (so $ryam$ is a valid arrangement, but $mrmy$ is not, because it uses the m twice).

Part a: List all elements of C.
Part b: Let S_1 be the event that the last letter of an arrangement is y, and S_2 be the event that the first letter of an arrangement is m. Of the elements in your list from part a, which are in $S_1 \cap S_2$?
Part c: Let S_1 and S_2 be as in part b. Of the elements in your list from part a, which are in $S_1 \cup S_2$?

2. Let $S_k = (1 - \frac{1}{k}, 1 + \frac{1}{k}]$ (the set of all x such that $1 - \frac{1}{k} < x \leq 1 + \frac{1}{k}$).

Part a: What is $S_1 \cup S_2 \cup S_3$? What is $S_1 \cap S_2 \cap S_3$?
Part b: Determine

$$\bigcup_{i=1}^{\infty} S_i \quad \text{and} \quad \bigcap_{i=1}^{\infty} S_i.$$

3. (Problem 1.2.11 from the text) For every one dimensional set C for which the integral exists, let $Q(C) = \int_C f(x)dx$, where

$$f(x) = \begin{cases} 6x(1-x) & \text{if } 0 < x < 1 \\ 0 & \text{elsewhere} \end{cases}$$

Otherwise let $Q(C)$ be undefined. Let $C_1 = \{x : \frac{1}{4} < x < \frac{3}{4}\}, C_2 = \{\frac{1}{2}\}$, $C_3 = \{x : 0 < x < 10\}$, and $C_4 = \{x : 0 < x < \frac{1}{4} \text{ or } \frac{1}{2} < x < \frac{3}{4}\}$.

Find $Q(C_1), Q(C_2), Q(C_3)$ and $Q(C_4)$.