MATH 61-02: WORKSHEET 1 (§1.1-1.2)

(W1) Let $\mathcal{P}(X)$ denote the power set of a set X.
Show that it is not in general true that $\mathcal{P}(A \cup B) = \mathcal{P}(A) \cup \mathcal{P}(B)$.
On the other hand, give an example where they are equal.

(W2) For any natural number n, define $A_n = (\frac{-1}{n}, \frac{1}{n})$, $B_n = [n, n + \frac{1}{n})$, $C_n = \{x \in \mathbb{R} \mid x < n < x^2\}$, and let $\mathcal{A} = \{A_n\}$, $\mathcal{B} = \{B_n\}$, $\mathcal{C} = \{C_n\}$ be the corresponding collections of sets, indexed over $\mathbb{N}$.

(a) On some number lines, sketch A_n, B_n, and C_n for $n = 1, 2, 3$.

(b) Find $\bigcup \mathcal{A}$ and $\bigcap \mathcal{A}$.

(W3) Let our universal set be $U = [6]$. Let $A = \{1, 2, 4, 5\}, B = \{1, 3, 5, 6\}, C = \{4, 5\}, D = \{1, 2, 6\}$, $E = \{2, 3, 6\}$. Use these sets and parentheses, unions, intersections, and complements to express the following sets. As an example, the set $\{2, 6\}$ is equal to $D \cap E$, among other possible expressions.

(a) $\{1, 4, 5\}$

(b) $\{2, 4\}$

(c) $\{2\}$