Class Exercise

For each of these sets, determine if it is finite, countably infinite, or uncountable.

- $\mathbb{Q}$
- The union of two countable sets
- $\bigcup_{i=1}^{\infty} A_i$ where A_i is finite for all $i \in \mathbb{Z}^+$.
- The set of all finite length binary strings
- The set of functions from A to X, where A is countably infinite and X is finite (e.g., $A = \mathbb{Z}$ and $X = \{1, 2, 3\}$).
- The set of functions from X to A, where A is countably infinite and X is finite (e.g., $A = \mathbb{Z}$ and $X = \{1, 2, 3\}$).
- $\mathbb{P}(Y)$, where Y is a finite set
- $\mathbb{P}(Y)$, where Y is a countably infinite set
- $\mathbb{R}$
- $\mathbb{R} \setminus \mathbb{Q}$