Read the whole (linked) handout §5.0 Set Theory Transition. Then do the below problems.

▷. As in class, let $\mathbb{R}^{>0}$ be the positive real numbers ⟨so $\mathbb{R}^{>0} = \{x \in \mathbb{R} \colon x > 0\}$⟩.

▶. Let the universal set U be $\mathbb{R}$. An index set I will be $\mathbb{R}^{>0}$ or a subset of $\mathbb{R}^{>0}$.

For each $r \in \mathbb{R}^{>0}$, define T_r to be the closed interval $[-r^2, r^2]$ of $\mathbb{R}$, i.e.,

$$T_r = \left\{x \in \mathbb{R} \colon -r^2 \leq x \leq r^2\right\}.$$

Find the sets listed below the dotted line. No justification needed. Your answer may be in:

set builder notation, roster method, interval (closed, open, or clopen) of the real line notation, $\mathbb{R}$, $\emptyset$.

Hint. In *Thinking Land*, draw a pictorial representation for T_1, T_2, T_3, T_{17} and for some arbitrary T_r's.

☺. Here is a sample. The index set is $I = \{m \in \mathbb{N} \colon 1 \leq m \leq 6\}$. ⟨Note $I = \{1, 2, 3, 4, 5, 6\}$ so $\bigcap_{i \in I} T_i = \bigcap_{i=1}^{6} T_i$.⟩

$$\bigcap_{i \in I} T_i = [-1, 1]$$

Hint. $\emptyset \neq \{0\}$

. . . .

1. The index set is $I = \{m \in \mathbb{N} \colon 1 \leq m \leq 6\}$.

$$\bigcup_{i \in I} T_i = \underline{\hspace{6cm}}$$

2. The index set is $\mathbb{N}$.

$$\bigcap_{i \in \mathbb{N}} T_i = \underline{\hspace{6cm}}$$

3. The index set is $\mathbb{N}$.

$$\bigcup_{i \in \mathbb{N}} T_i = \underline{\hspace{6cm}}$$

4. The index set is $\mathbb{R}^{>0}$.

$$\bigcap_{i \in \mathbb{R}^{>0}} T_i = \underline{\hspace{6cm}}$$

5. The index set is $\mathbb{R}^{>0}$.

$$\bigcup_{i \in \mathbb{R}^{>0}} T_i = \underline{\hspace{6cm}}$$