Venn Diagrams and Indexed Sets

1. Venn Diagrams

2. Indexed Sets

   (a) Finite Examples and Definitions

(b) Infinite and More General Examples and Definitions

3. Draw a Venn Diagram for each set and then answer the questions.

   (a) $A \cap B$ (e) $\overline{A} \cup \overline{B}$

   (b) $\overline{A \cap B}$

                                                           (f) Use the work above to make a conjecture.

   (c) $\overline{A}$

                                                           (g) Make a conjecture about $A \cup B$ and check it
   (d) $\overline{B}$ with a Venn Diagram.

4. Suppose $A_n = \{n, n+1, n+2, \ldots, 2n\}$ for $n \in \mathbb{N}$.

   (a) Determine the sets A_1, A_2, and A_3 by writing out their elements.

   (b) $\displaystyle\bigcup_{n \in \mathbb{N}} A_n =$

   (c) $\displaystyle\bigcap_{n \in \mathbb{N}} A_n =$

5. Suppose $B_\alpha = [1, 3 - \alpha] \subseteq \mathbb{R}$ for $\alpha \in [0, 1)$.

   (a) Determine the set B_α for four different values of α.

   (b) $\displaystyle\bigcup_{\alpha \in [0,1]} A_\alpha =$

   (c) $\displaystyle\bigcap_{\alpha \in [0,1]} A_\alpha =$

6. For each $i \in I$, A_i is a set. Suppose $J \subseteq I$.

   (a) Draw a Venn diagram of sets I and J.

   (b) Is it possible to determine the relationship between:

   i. $\displaystyle\bigcup_{i \in I} A_i$ and $\displaystyle\bigcup_{j \in J} A_j$? Explain.

   ii. $\displaystyle\bigcap_{i \in I} A_i$ and $\displaystyle\bigcap_{j \in J} A_j$? Explain.