Math 131 - Dr. Miller - Supplement to HW #16, Fall 2024

1. Consider the family of sets defined by $B_n = \left(\frac{n-1}{n}, n + \frac{1}{n}\right]$ for each $n \in \mathbf{Z}^+$.

   (a) Use interval notation to write B_1 and then $(B_1)^c$, where the universal set is the entire real number line. Indicate which answer is which.

   (b) Use interval notation to write $B_1 \setminus B_2$, $\bigcap_{n=2}^{4} B_n$, $\bigcup_{n=1}^{\infty} B_n$, and $\bigcap_{n=1}^{\infty} B_n$. (Number line graphs help!)

2. Consider the family of sets defined by $B_n = \left[\frac{n+1}{n}, 3n - \frac{1}{n}\right]$ for each $n \in \mathbf{Z}^+$.

   (a) Use interval notation to write B_1 and then $(B_1)^c$, where the universal set is the entire real number line. Indicate which answer is which.

   (b) Use interval notation to write $B_1 \setminus B_2$, $\bigcap_{n=2}^{4} B_n$, $\bigcup_{n=1}^{\infty} B_n$, and $\bigcap_{n=1}^{\infty} B_n$. (Number line graphs help!)

3. Consider the family of sets B_i where for each positive integer i, $B_i = \{x \in \mathbf{R} \mid 1 - \frac{1}{i} < x \leq i \}$.

   (a) Write B_1 and B_2 in the correct choice of roster or interval notation. Tell which set is which.

   (b) Given that the universal set is $\mathbf{R}$, use correct notation to write the complement of B_3.

   (c) Use correct notation to find $B_1 \setminus B_2$, $\bigcup_{n=1}^{\infty} B_n$, and $\bigcap_{n=1}^{\infty} B_n$. Indicate which answer is which.

4. Now redefine the sets B_i from Problem #3 above as $B_i = \{x \in \mathbf{Z} \mid 1 - \frac{1}{i} < x \leq i \}$ (note that this is a little different!) and answer the same questions (a)-(c).

5. Consider the family of sets C_i where for each non-negative integer i, $C_i = [(-1)^i(i),\ i+1]$

   (a) Write C_0 and C_1 in the correct choice of roster or interval notation. (0 is neither positive nor negative, so yes, C_0 is defined.)

   (b) Use correct notation to find $C_1 \setminus C_0$.

   (c) Find $\bigcup_{i=0}^{\infty} C_i$ and $\bigcap_{i=0}^{\infty} C_i$, telling which is which.