Reading Quiz Section 4.2

1. Let $\mathcal{U} = \mathbb{Z}$, $A = 2\mathbb{Z}$, $B = \{1, 3, 5\}$. Which of the following statements are true?
   (a) $B \subseteq A^{\mathsf{C}}$.
   (b) A and B are not disjoint
   (c) $A \cup B = \mathbb{Z}$.
   (d) $\mathbb{Z} \setminus B$ is finite
   (e) $A^{\mathsf{C}} = 2\mathbb{Z} + 1$

2. True or False: if A and B are sets, then $B \subseteq A \cup B$.

3. For sets A and B, the result that $(A \cup B)^{\mathsf{C}} = A^{\mathsf{C}} \cap B^{\mathsf{C}}$ is most similar to which of the following laws of logic?
   (a) Law of double negation
   (b) Law of absorption
   (c) De Morgan's law(s)
   (d) Law of associativity

4. For sets A and B, which of the following are true?
   (a) $A \cap B \subseteq A \setminus B$
   (b) $B = (A \cap B) \cup (B \setminus A)$
   (c) $A \cup B = (A \setminus B) \cup (A \cap B) \cup (B \setminus A)$
   (d) $A \setminus B = B \setminus A$

Practice Problems Section 4.2

1. Let $a, b, c, d \in \mathbb{R}$. Show

   $$(a, b) \cap (c, d) = \big(\max\{a, c\}, \min\{b, d\}\big)$$

   where we take the convention that $(\alpha, \beta) = \emptyset$ if $\beta < \alpha$.

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2. Let $\mathcal{U}$ be a universal set and A and B sets. Prove that $(A \setminus B)^{\mathsf{C}} = A^{\mathsf{C}} \cup B$.

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3. Let A be a set. Prove that if $A \cup B \subseteq B$ for every set B, then $A = \emptyset$.

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