1. Find a collection of open intervals $S_n = (?, ?)$ enumerated by the natural numbers with
$$\bigcap_{n\in\mathbb{N}} S_n = [-1, 1]$$
Solution: We may use $S_n = \left(-1 - \frac{1}{n}, 1 + \frac{1}{n}\right)$.

2. Skip.

3. Which of the following sentences are statements? For those that are, indicate the truth value.
   (a) The number 16 is prime.
   Solution: False.
   (b) Is it true that $3 \cdot 4 = 12$?
   Solution: Not a statement.
   (c) $3 \cdot 4 = 12$.
   Solution: True.
   (d) $\emptyset \in \emptyset$
   Solution: False.
   (e) $\emptyset \subseteq \emptyset$
   Solution: True.
   (f) $\emptyset \in \{\emptyset\}$
   Solution: True.
   (g) $\emptyset \subseteq \{\emptyset\}$
   Solution: True.

4. Suppose $p(x)$ is the open sentence $2x^2 + 5x - 3 = 0$.
   (a) Over the domain $\mathbb{R}$ for which $x \in \mathbb{R}$ is this statement true? For which is it false? Write these in set notation.
   Solution: This sentence is true for $\left\{\frac{1}{2}, -3\right\}$ and false for $\left\{x \in \mathbb{R} \mid x \neq \frac{1}{2} \text{ and } x \neq -3\right\}$.
   (b) Over the domain $\mathbb{Z}$ for which $x \in \mathbb{Z}$ is this statement true? For which is it false? Write these in set notation.
   Solution: This sentence is true for $\{-3\}$ and false for $\{x \in \mathbb{Z} \mid x \neq -3\}$.

5. Suppose $p(A)$ is the open sentence $A \not\subseteq \{1, 2\}$. For which $A \in \mathcal{P}(\{1, 2, 3\})$ is this statement true? Write this in set notation.
   Solution: This is true for the set $\{\{3\}, \{1, 3\}, \{2, 3\}, \{1, 2, 3\}\}$.

6. Sketch the subset of $\mathbb{Z} \times \mathbb{Z}$ given by $\{(x, y) \mid x, y \in \mathbb{Z} \times \mathbb{Z} \text{ and } 2x - y \leq 1\}$
   Solution: