Problem 1. Show that the following pairs of sets are not equal by exhibiting an element of one that is not an element of the other.

(a) 
\[ A = \{1, 2\} \]
\[ B = \{1, \{2\}\} \]

(b) 
\[ C = \mathcal{P}(\{1, 2\}) \]
\[ D = \{\{1\}, \{2\}, \{1, 2\}\} \]

(c) 
\[ E = \{1, 2\} \times \{2, 3\} \]
\[ F = \{3, 2\} \times \{2, 1\} \]

Problem 2. Let
\[ A = \{1, 2, 4\} \]
\[ B = \{1, 2, 5\} \]
List the elements of the following sets, without repeating any elements:

(a) 
\[ \{\{m, n\} | m \in A \text{ and } n \in B\} \]

(b) 
\[ \{(m, n) | m \in A \text{ and } n \in B\} \]

Problem 3. List every subset \( S \) of \( \{1, 2, 3, 4, 5\} \) for which
\[ S \cap \{1, 3, 5\} \subseteq \{1\} \]

Problem 4. Number 28 of section 2.2.

Problem 5. True or false:

(a) \( (1, 1) \in \{(1, 1), (1, 2), (2, 1)\} \cap \{(1, 2), (2, 1)\} \)

(b) \( \{1, 2\} \in \{(1, 1), (1, 2), (2, 1)\} \)

(c) \( (1, 2) \in \{1, 2\} \times \{2, 3\} \).
Problem 6. Show that if

\[ A \neq B \]

then

\[ \mathcal{P}(A) \neq \mathcal{P}(B). \]