HOMEWORK #1

Problem 1. Show that the following pairs of sets are not equal:

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

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

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

(d) In this example, \( n \) is restricted to being an integer.
\[ G = \{2n + 2 \mid 0 \leq n \leq 200\} \]
\[ H = \{2n - 2 \mid 1 \leq n \leq 201\} \]

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

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

Problem 3. Show that for any sets \( A \) and \( B \),
\[ A \setminus B = A \setminus (A \cap B). \]

Problem 4. Find an example that shows it is possible to have
\[ A \times B = A \times C \]
and also
\[ B \neq C. \]
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) \((1, 2) \in \{1, 2\} \times \{2, 3\}.\)