Name: _____

Directions: Solve the following problems. Give supporting work/justification where appropriate.

1. **[6 parts, 1 point each]** Let the universe U be $\{1, \ldots, 5\}$. Let $A = \{1, 2, 3\}$, $B = \{1, 3\}$, and $C = \{2, 3\}$. Find the following sets.

   (a) $B \cap C$

   (b) $C - B$

   (c) $B \cup \overline{A}$

   (d) $(B \times C) - (C \times B)$

   (e) $\mathcal{P}(A) - \mathcal{P}(B \cup C)$

   (f) $\mathcal{P}(A) - (\mathcal{P}(B) \cup \mathcal{P}(C))$

2. **[1 point]** Are there sets A and B such that $A \cap (A \times B)$ is nonempty? If yes, then give an example. If not, then explain why.

3. **[3 parts, 1 point each]** Let $A = \{(x, y) \in \mathbb{R}^2 \colon\ y \geq x\}$ and $B = \{(x, y) \in \mathbb{R}^2 \colon\ x^2 + y^2 \leq 1\}$. Sketch the following sets in the plane, using solid lines to represent boundaries that are in the set, and dashed lines/open circles to represent boundaries that are not in the set.

   (a) A

   (b) B

   (c) $B - A$