CS 173, Fall 2016
Examlet 3, Part B

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Discussion: **Thursday** **2** **3** **4** **5** **Friday 9** **10** **11** **12** **1** **2**

1. (4 points) $M = \{\text{cereal}, \text{toast}\}$ $\qquad N = \{\text{milk}, \text{coffee}, \text{wine}\}$

    $P = \{\text{wine}, \text{beer}, (\text{coffee}, \text{ham}), (\text{milk}, \text{ham})\}$

    $M \times (N - P) =$

    $|M \times N \times P| =$

2. (4 points) Check the (single) box that best characterizes each item.

    $\forall x \in \mathbb{R}$, if $x^2 = 3$, then $x > 1000$.

    true ☐ false ☐ undefined ☐

    $A \cap (B \cup C)$
    $= (A \cap B) \cup (A \cap C)$

    true for all sets A ☐ true for some sets A ☐
    false for all sets A ☐

3. (7 points) In $\mathbb{Z}_{17}$, find the value of $[5]^{42}$. You must show your work, keeping all numbers in your calculations small. **You may not use a calculator.** You must express your final answer as $[n]$, where $0 \leq n \leq 16$.

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1. (4 points) Is this claim true? Give a concrete counter-example or briefly explain why it's true.

   For any sets A, B, and C, if $A \times C \subseteq B \times C$, then $A \subseteq B$.

2. (4 points) Check the (single) box that best characterizes each item.

   For all positive integers n,
   if $n! < -10$, then $n > 8$.   true ☐   false ☐   undefined ☐

   $A \times B = A$ true for all sets A and B ☐   false for all sets A and B ☐
                                true for some sets A and B ☐

3. (7 points) In $\mathbb{Z}_9$, find the value of $[5]^{38}$. You must show your work, keeping all numbers in your calculations small. **You may not use a calculator.** You must express your final answer as $[n]$, where $0 \leq n \leq 8$.

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1. (4 points) Is this claim true? Give a concrete counter-example or briefly explain why it's true.

   For any sets A, B, and C, $A \cup (B - C) \subseteq (A \cup B) - C$

2. (4 points) Check the (single) box that best characterizes each item.

   Sets A and B are disjoint $A - B = B - A$ ☐ $A = \overline{B}$ ☐

   $A \cap B = \{\emptyset\}$ ☐ $A \cap B = \emptyset$ ☐

   $\emptyset$ is

   an element of $\mathbb{Z}$ ☐   a subset of $\mathbb{Z}$ ☐   both ☐   neither ☐

3. (7 points) In $\mathbb{Z}_{13}$, find the value of $[7]^{19}$. You must show your work, keeping all numbers in your calculations small. **You may not use a calculator.** You must express your final answer as $[n]$, where $0 \leq n \leq 12$.

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1. (4 points) $A = \{\text{fox, tiger, wolf, eagle, cat}\}$ $B = \{3, 4\}$ $C = \{6, 7\}$

   $A \times (B \cap C) =$

   $|\, A \times (B \cup C) \,| =$

2. (4 points) Check the (single) box that best characterizes each item.

   Sets A and B are disjoint $A \cap B = \{\emptyset\}$ ☐ $A \cap B = \emptyset$ ☐

   $|A \cap B| = 1$ ☐ $A = \overline{B}$ ☐

   $\emptyset \times \emptyset =$

   $\emptyset$ ☐ $\{\emptyset\}$ ☐ $\{\emptyset, \emptyset\}$ ☐ $\{(\emptyset, \emptyset)\}$ ☐

3. (7 points) In $\mathbb{Z}_{11}$, find the value of $[7]^{40}$. You must show your work, keeping all numbers in your calculations small. **You may not use a calculator.** You must express your final answer as $[n]$, where $0 \leq n \leq 10$.

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1. (4 points) Is this claim true? Give a concrete counter-example or briefly explain why it's true.

   For any sets A, B, and C, $(A \cup B) - C = A \cup (B - C)$.

2. (4 points) Check the (single) box that best characterizes each item.

   If $x \in A \cup B$,
   then $x \in A$.

   true for all sets A and B ☐   true for some sets A and B ☐

   false for all sets A and B ☐

   $\{1,2\} \cup \emptyset =$

   $\emptyset$ ☐ $\{(1, \emptyset), (2, \emptyset)\}$ ☐ $\{1, 2, \emptyset\}$ ☐

   $\{\emptyset\}$ ☐ $\{1, 2\}$ ☐   undefined ☐

3. (7 points) In $\mathbb{Z}_{13}$, find the value of $[7]^{21}$. You must show your work, keeping all numbers in your calculations small. **You may not use a calculator.** You must express your final answer as $[n]$, where $0 \le n \le 12$.

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1. (4 points) $A = \{\text{fox}, \text{cat}\}$ $B = \{3, 4\}$ $C = \{3, 7\}$

   $A \times (B \cap C) =$

   $A \cap B =$

2. (4 points) Check the (single) box that best characterizes each item.

   $|A \cup B| = |A| + |B|$ true for all sets A   ☐   true for some sets A   ☐

   false for all sets A   ☐

   $\emptyset \times A = A \times \emptyset$ true for all sets A   ☐   false for all sets A   ☐

   true for some sets A   ☐

3. (7 points) In $\mathbb{Z}_{11}$, find the value of $[8]^{37}$. You must show your work, keeping all numbers in your calculations small. **You may not use a calculator.** You must express your final answer as $[n]$, where $0 \leq n \leq 10$.