CS 173, Spring 19 Examlet 3, white sheet

Name:____

NetID:____________________ **Lecture:** **A** **B**

Discussion: **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

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

   For any sets A and B, $(A \cap B) \cup (A \cap \overline{B}) = A$.

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

   If $x \in A \cap B$, 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 ☐

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

3. (7 points) In $\mathbb{Z}_7$, find the value of $[3]^{37}$. 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 $0 \leq n \leq 6$.

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1. (4 points) $A = \{4, 5, 9\}$ $B = \{\text{arya}, \text{bran}\}$ $C = \{\ 2, 4, 10\ \}$

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

   $|A \times B \times C| =$

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

$A \times A = A$ (Assume $A \neq \emptyset$)	true for all sets A	☐	false for all sets A	☐
	true for some sets A	☐		
$\emptyset \subseteq A$	true for all sets A	☐	true for some sets A	☐
	false for all sets A	☐		

3. (7 points) In $\mathbb{Z}_{11}$, find the value of $[6]^{42}$. 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 $0 \leq n \leq 10$.

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

   $M \times (N - P) =$

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

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

   $\overline{A \cup B} = \overline{A} \cap \overline{B}$ true for all sets A and B ☐ true for some sets A and B ☐ false for all sets A and B ☐

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

3. (7 points) In $\mathbb{Z}_{17}$, find the value of $[5]^{37}$. 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 $0 \leq n \leq 16$.

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1. (4 points) $A = \{\text{trump}, \text{rubio}\}$ $B = \{\text{clinton}, \text{sanders}\}$
   $C = \{\ (\text{trump}, \text{clinton}),\ (\text{sanders}, \text{rubio})\ \}$
   $(B \times A) - C =$

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

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

$A \cap B = A \cup B$	true for all sets A and B ☐ false for all sets A and B ☐	true for some sets A and B ☐
For all reals n, if $n^2 = 101$, then $n > 11$.	true ☐	false ☐ undefined ☐

3. (7 points) In $\mathbb{Z}_9$, find the value of $[4]^6 \times [5]^{20}$. 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) $A = \{\text{ginger}, \text{clove}, \text{nutmeg}\}$ $B = \{\text{ginger}, \text{vanilla}, \text{pepper}\}$ $C = \{\ (\text{clove}, \text{nutmeg})\ \}$

   $A \cap B =$

   $A \cap C =$

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

   For any sets A and B,
   if $x \in A - B$, then $x \in A$. true ☐ false ☐

   $\{\emptyset\} \subseteq A$ 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 and B, $A \cup (B - A) = A \cup B$.

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

   Let A and B be disjoint. $|A - B| = |A| - |B|$

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

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

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

3. (7 points) In $\mathbb{Z}_7$, find the value of $[3]^{41}$. 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 $0 \leq n \leq 6$.

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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 $A \cap B = \emptyset$ and $B \cap C = \emptyset$ then $A \cap C = \emptyset$.

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

   $|A \cup B| \leq |A| + |B|$ true for all sets A and B ☐ true for some sets A and B ☐ false for all sets A and B ☐

   $\forall x \in \mathbb{Q}$, if $x^2 = 3$, then $x > 1000$. true ☐ false ☐ undefined ☐

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) $A = \{\text{oak}, \text{apple}, \text{maple}, \text{elm}\}$ $B = \{\text{tree}, \text{leaf}, \text{oak}\}$ $C = \{(\text{oak}, \text{tree})\}$

   $|A \times (B - C)| =$

   $A \cap B =$

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

Sets A and B are disjoint	$A - B = B - A$ ☐	$A = \overline{B}$ ☐		
	$A \cap B = \{\emptyset\}$ ☐	$A \cap B = \emptyset$ ☐		
$\{1, 2\} \times \emptyset =$	$\emptyset$ ☐	$\{(1, \emptyset), (2, \emptyset)\}$ ☐	$\{1, 2, \emptyset\}$ ☐	
	$\{\emptyset\}$ ☐	$\{1, 2\}$ ☐	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 $0 \leq n \leq 12$.