CS 173, Spring 18 Examlet 3, Part B

Name:_____

NetID:_____ **Lecture: A B**

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

1. (4 points) $A = \{\text{fox}, \text{cat}\}$ $B = \{\text{rat}, \text{mouse}\}$

   $A \cap B =$

   $\{p^2 + q \mid p \in \mathbb{Z},\ q \in \mathbb{Z},\ 1 \leq p \leq 2 \text{ and } 1 \leq q \leq 3\} =$

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

   For all integers n, if $n^2 = 101$, then $n > 11$.
   true ☐ false ☐ undefined ☐

   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 ☐

3. (7 points) In $\mathbb{Z}_{11}$, find the value of $[6]^6 + [5]^3$. 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, if $A \subseteq B$ then $A \times C \subseteq B \times C$.

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

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

   Sets A and B are disjoint $A \cap B = \{\emptyset\}$ ☐ $A \cap B = \emptyset$ ☐ $|A \cap B| = 1$ ☐ $A = \overline{B}$ ☐

3. (7 points) In $\mathbb{Z}_{11}$, find the value of $[8]^{22}$. 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, $A \cup (B - C) \subseteq (A \cup B) - C$

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

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

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

3. (7 points) In $\mathbb{Z}_{13}$, find the value of $[6]^8 + [5]^{20}$. 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 $0 \leq n \leq 12$.

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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 $A \subseteq B$ then $A \cap C \subseteq B \cap C$.

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

   $A = \overline{A}$ (Assume the universe is not empty.)
   true for all sets A ☐ true for some sets A ☐
   false for all sets A ☐

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

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) $A = \{\text{oak}, \text{apple}, \text{maple}, \text{elm}\}$ $B = \{\text{tree}, \text{oak}, \emptyset\}$

   $A \cap B =$

   $\{(p, q) \ : \ p \in \mathbb{Z}^+, q \in \mathbb{Z}^+, \text{ and } pq = 6\} =$

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

$\emptyset \in A$	true for all sets A ☐	true for some sets A ☐
	false for all sets A ☐	
$\lvert A \cup B \rvert = \lvert A \rvert + \lvert B \rvert$	true for all sets A and B ☐	true for some sets A and B ☐
	false for all sets A and B ☐	

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 $0 \leq n \leq 10$.

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1. (4 points) $A = \{\text{fox, tiger, wolf}\}$ $B = \{3, 4\}$ $C = \{6, 7, 8\}$

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

   $\{p + q \mid p \in \mathbb{Z},\ q \in \mathbb{Z},\ 1 \leq p \leq 3 \text{ and } 1 \leq q \leq 3\} =$

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

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

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

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

   $A \cup B = A$

   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 $\mathbb{Z}_{11}$, find the value of $[10]^{43} + [7]^{10}$. 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 $0 \leq n \leq 10$.