Name:_____

NetID:_____ **Lecture: A B**

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

1. (4 points) $A = \{\text{water}, \text{beer}, \text{wine}\}$ $B = \{\text{ cup}, \text{mug }\}$ $C = \{\text{wine}, \ (\text{water}, \text{beer})\ \}$

   $(A - C) \times B =$

   $A \cap B =$

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

   $\forall x \in \mathbb{N}$, if $x < -10$, then $x = \pi$.
   (π is the familiar constant.) true ☐ false ☐ undefined ☐

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

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 $0 \leq n \leq 6$.

Name:_____

NetID:_____ **Lecture: A B**

Discussion: Thursday Friday 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, B, and C, $(A - B) \cup (B - C) = (A \cup B) - (A \cap B \cap C)$

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

   $\emptyset \subseteq A$ true for all sets A ☐ true for some sets A ☐ false for all sets A ☐

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

3. (7 points) In $\mathbb{Z}_9$, find the value of $[5]^{21}$. 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 $0 \leq n \leq 8$.

Name:_____

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Discussion: Thursday Friday 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, B, and C, $(A - B) - C = A - C$

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

   $A \times B = B \times A$ — 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 $\mathbb{Z}_{11}$, 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 $0 \leq n \leq 10$.

Name:_____

NetID:_____ **Lecture: A B**

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

1. (4 points) $A = \{\text{water}, \text{beer}, \text{wine}\}$ $B = \{\ \text{cup}, \text{mug}\ \}$ $C = \{\text{wine},\ (\text{water}, \text{beer})\ \}$

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

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

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 ☐

   $\{13, 14, 15\} \times \emptyset =$
   $\emptyset$ ☐ $\{\emptyset\}$ ☐ $\{13, 14, 15\}$ ☐

3. (7 points) In $\mathbb{Z}_{11}$, find the value of $[7]^{12} + [9]^5$. 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 $0 \leq n \leq 10$.

Name:_____

NetID:_____ **Lecture: A B**

Discussion: Thursday Friday 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, B, and C, $A \times (B - C) = (A \times B) - (A \times C)$

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

   $\forall x \in \mathbb{R}$, if $\pi = 3$, then $x < 20$.
   (π is the familiar constant.) true ☐ false ☐ undefined ☐

3. (7 points) In $\mathbb{Z}_{13}$, find the value of $[7]^{18} + [7]^4$. 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 $0 \leq n \leq 12$.

Name:_____

NetID:_____ **Lecture: A B**

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

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.

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

   $\emptyset \times \emptyset =$ $\{\emptyset, \emptyset\}$ ☐ $\{\emptyset\}$ ☐ $\emptyset$ ☐ undefined ☐

3. (7 points) In $\mathbb{Z}_{11}$, find the value of $[7]^{38}$. 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 $0 \leq n \leq 10$.