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 $x \in A \cap B$,   true for all sets A and B ☐   true for some sets A and B ☐
   then $x \in A$.   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 $0 \leq n \leq 6$.

Name:_____

NetID:_____   **Lecture:**   **A**   **B**

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

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.

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

   (Assume $A \neq \emptyset$)   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 $0 \leq n \leq 10$.

Name: _____

NetID: _____   **Lecture:**   **A**   **B**

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

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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 $0 \le n \le 16$.

Name:_____

NetID:_____   **Lecture:**   **A**   **B**

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

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 ☐   true for some sets A and B ☐

                    false for all 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 $0 \le n \le 8$.

Name:_____

NetID:_____   **Lecture:**   **A**   **B**

Discussion: **Thursday**   **Friday**   **9**   **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.

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

   $\{\emptyset\} \subseteq A$ true for all sets A $\square$ true for some sets A $\square$

                    false for all sets A $\square$

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 $0 \leq n \leq 16$.

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, $A \cup (B - A) = A \cup B$.

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

    Let A and B be disjoint.   true for all sets A and B   ☐   true for some sets A and B   ☐
    $|A - B| = |A| - |B|$ 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 $0 \leq n \leq 6$.

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, 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 $0 \leq n \leq 12$.

Name:_____

NetID:_____   **Lecture:**   **A**   **B**

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

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 $0 \leq n \leq 12$.

Name:_____

NetID:_____　　**Lecture:**　　**B**

Discussion:　　**Thursday**　　**Friday**　　**11**　　**12**　　**1**　　**2**　　**3**　　**4**

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.

   $A \cap (B \cup C)$　　　　　true for all sets A,B,C　☐　　　　true for some sets A,B,C　☐
   $= (A \cap B) \cup (A \cap C)$　false for all sets A,B,C　☐

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

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:**   **B**

Discussion: **Thursday**   **Friday**   **11**   **12**   **1**   **2**   **3**   **4**

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.

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

    $|A \cup B| = |A| + |B|$ true for all sets A and B $\square$ true for some sets A and B $\square$
                                 false for all sets A and B $\square$

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 $0 \leq n \leq 10$.

Name:_____

NetID:_____   **Lecture:**   **A**   **B**

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

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

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

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 $x \in A \cup B$,   true for all sets A and B ☐   true for some sets A and B ☐
   then $x \in A$.   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 $0 \le n \le 10$.

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, 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 $0 \le n \le 10$.

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, 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 $0 \le n \le 12$.

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, 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 $0 \leq n \leq 10$.

Name:_____

NetID:_____   **Lecture:**   **A**   **B**

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

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 ☐

   $|A \cup B| = |A| + |B|$ 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 $0 \leq n \leq 10$.

Name:_____

NetID:_____   **Lecture:**   A   B

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

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

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

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

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 $0 \leq n \leq 10$.

Name:＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

NetID:＿＿＿＿＿＿＿＿＿＿＿　　　**Lecture:　　A　　B**

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

1. (4 points)　$A = \{\text{oak}, \text{apple}, \text{maple}, \text{elm}\}$　　　$B = \{\text{tree}, \text{oak}, \emptyset\}$

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

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

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

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

   Let A and B be disjoint.　　true for all sets A and B ☐　　　　true for some sets A and B ☐
   $|A - B| = |A| - |B|$　　　　false for all sets A and B ☐

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 $0 \le n \le 6$.

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, $(A - B) \cup (B - A) \subseteq (A \cup B) - (A \cap B)$

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

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

   $\{1, 2\} \times \emptyset =$ $\emptyset$ $\Box$ $\{(1, \emptyset), (2, \emptyset)\}$ $\Box$ $\{1, 2, \emptyset\}$ $\Box$
        $\{\emptyset\}$ $\Box$ $\{1, 2\}$ $\Box$ undefined $\Box$

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 $0 \leq n \leq 8$.

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, B, and C, $(A - B) - C \subseteq A - C$

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

    $|A - B| = |A| - |B|$ true for all sets A and B ☐   true for some sets A and B ☐

    false for all sets A and B ☐

    For all reals n, if $n^2 = 101$,
    then $n > 11$.   true ☐   false ☐   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 $0 \leq n \leq 12$.

Name:_____

NetID:_____   **Lecture:**   **A**   **B**

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

1. (4 points) $A = \{\text{earth}, \text{air}, \text{fire}\}$ $B = \{\ (\text{fire}, 3),\ (\text{water}, 2)\ \}$ $C = \{\ 1, 2, 3\ \}$
   $(A \times C) \cap B =$

   $\{p + q \mid p \in \mathbb{Z},\ q \in \mathbb{Z},\ pq = 6\} =$

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   ☐

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

3. (7 points) In $\mathbb{Z}_9$, find the value of $[5]^{41}$. 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 $0 \leq n \leq 8$.

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, 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.

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

   $A \cap B \subseteq A$ 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 $\mathbb{Z}_{17}$, 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 $0 \leq n \leq 16$.

Name:_____

NetID:_____   **Lecture:**   **A**   **B**

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

1. (4 points) State the Inclusion Exclusion Principle/Formula for two sets.

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

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

$A \cap B = A \cup B$ 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 $\mathbb{Z}_{13}$, 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 $0 \leq n \leq 12$.

Name:_____

NetID:_____   **Lecture:**   **A**   **B**

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

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

   $A \cap B =$

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:_____

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, $(A - B) - C = A - C$

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 $x \in A \cap B$,   true for all sets A and B   ☐   true for some sets A and B   ☐
   then $x \in A$.   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 $0 \le n \le 12$.

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 $0 \leq n \leq 10$.