

Homework 5

Due on Friday, 6/9, 1:15 PM in class

Name _____ PID _____

Honor Code Pledge: I certify that I am aware of the Honor Code in effect in this course and observed the Honor Code in the completion of this homework.

Signature _____

(48') 1. Let A, B, C be three sets such that $A = \{a, b\}$, $B = \{a, b, c\}$, $C = \{a, b, \{a, b, c\}\}$. Also, we let \emptyset denotes the empty set. Answer the following questions. Your answer can be just "Yes" or "No."

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|--------------------------|------------|--|------------|
| (a) Is $A \in B$? | No | (g) Is $\emptyset \in C$? | No |
| (b) Is $A \subseteq B$? | Yes | (h) Is $\emptyset \subseteq C$? | Yes |
| (c) Is $B \in C$? | Yes | (i) Is $\emptyset = 0$? | No |
| (d) Is $B \subseteq C$? | No | (j) Is $\emptyset = \{\emptyset\}$? | No |
| (e) Is $A \in C$? | No | (k) Is $\emptyset \in \{\emptyset\}$? | Yes |
| (f) Is $A \subseteq C$? | Yes | (l) Is $\emptyset \subseteq \{\emptyset\}$? | Yes |

(12') 2. Write the resulting set of each of the following expressions.

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| (a) $\{a, \{b, c\}\} \cup \{\{a, b\}, c\}$ | Solution: $\{a, c, \{b, c\}, \{a, b\}\}$ |
| (b) $\{\{1, 2, 3\}, \{4, 5\}\} \cap \{\{1, 2\}, \{3, 4, 5\}\}$ | Solution: \emptyset |
| (c) $\{\{s, t, x\}, y, z\} - \{s, t, x, y, z\}$ | Solution: $\{\{s, t, x\}\}$ |

(8') 3. Suppose the universal set is the set of real numbers. Write the complement of the following intervals. (Write the solution also in the interval form, i.e., using "(", ")", "[", and/or "]".)

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|-------------------|---|
| (a) $(-1, 3]$ | Solution: $(-\infty, -1] \cup (3, \infty)$ |
| (b) $(2, \infty)$ | Solution: $(-\infty, 2]$ |

(8') 4. Answer the following questions about sets and tuples by "Yes" or "No."

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|--|------------|
| (a) Is $\{(1,2), (1,2,3)\} = \{(1,2,3), (1,2)\}$? | Yes |
| (b) Is $(\{1,2\}, \{1,2,3\}) = (\{1,2,3\}, \{1,2\})$? | No |

(20') 5. Let A, B, C be three sets such that $A = \{1, 2\}$, $B = \{a, b\}$, $C = \{1,2,3\}$. Write the resulting set of each of the following Cartesian products.

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|-----------------------------|---|
| (a) $A \times B$ | Solution: $\{(1,a), (1,b), (2,a), (2,b)\}$ |
| (b) $B \times A$ | Solution: $\{(a,1), (a,2), (b,1), (b,2)\}$ |
| (c) $B \times (A \cup C)$ | Solution: $\{(a,1), (a,2), (a,3), (b,1), (b,2), (b,3)\}$ |
| (d) $(A \times B) \times C$ | Solution: $\{((1,a),1), ((1,a),2), ((1,a),3), ((1,b),1), ((1,b),2), ((1,b),3), ((2,a),1), ((2,a),2), ((2,a),3), ((2,b),1), ((2,b),2), ((2,b),3)\}$ |
| (e) $A \times B \times C$ | Solution: $\{(1,a,1), (1,a,2), (1,a,3), (1,b,1), (1,b,2), (1,b,3), (2,a,1), (2,a,2), (2,a,3), (2,b,1), (2,b,2), (2,b,3)\}$ |

(4') 6. Write the power set of $\{x, \{y, z\}\}$.

Solution: $\{ \emptyset, \{x\}, \{\{y, z\}\}, \{x, \{y, z\}\} \}$