Name _____ Test 2, Fall 2019

Part 1: Definitions and Concepts

1) Answer true or false for each of the statements below. (6. $\overline{6}$ point each)

T or F (I) $\{3\} \in \{3\}$

T or F (II) $\{3\} \subseteq \{3\}$

T or F (III) $\{3\} \subset \{3\}$

T or F (IV) $\{3\} \in \{\{3\}\}$

T or F (V) $\{3\} \subseteq \{\{3\}\}$

T or F (VI) $\{3\} \subset \{\{3\}\}$

T or F (VII) $\{3\} \in \{3,4\}$

T or F (VIII) $\{3\} \subseteq \{3,4\}$

T or F (IX) $\{3\} \subset \{3,4\}$

T or F (X) $\{3\} = \{3\}$

T or F (XI) $\{3\} = \{\{3\}\}$

For the next couple questions, define $S = \{3\}$.

T or F (XII) $\exists_{x \in S}(x = 3)$

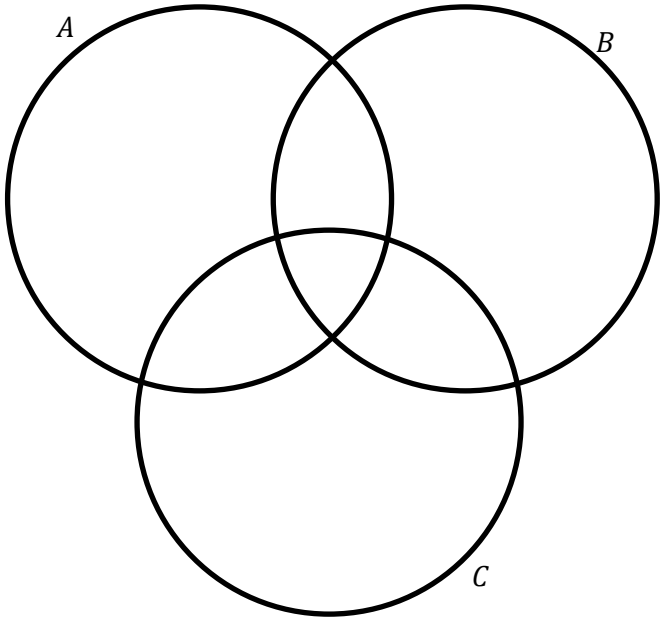
T or F (XIII) $\forall_{x \in S}(x = 3)$

T or F (XIV) $\exists_{x \in S}(x = \{3\})$

T or F (XV) $\forall_{x \in S}(x = \{3\})$

2) Give the definition of mutually exclusive. Be mathematically precise, vague answers will be given no credit. (50 points)

3) Shade in the region $A \cap (B \cup C)$ on the Venn Diagram below.
(50 points)



4) Find $\{2,3,4,5\} \cap \{4,5,6,7\}$
(25 points)

5) Find $\{2,3,4,5\} - \{4,5,6,7\}$
(25 points)

6) Find $[2,5] \cap [4,7]$
(25 points)

7) Find $[2,5] - [4,7]$
(25 points)

Part 2: Proofs

8) Below is a partial proof of the statement below. Finish the proof.

$$(A \cup B = B) \Rightarrow A \subseteq B$$

(100 points)

Line	Statement	Reasoning
(1)	$A \cup B = B$	Premise
(2)	Assume $x \in A$	
(3)	_____	_____
(4)	$x \in B$	_____
(3)	$A \subseteq B$	The implication formed from lines 2-4.

9) Let A be a set. Prove that $\emptyset \times A = \emptyset$

(100 points)

10) Assuming up to theorem T67 only, prove theorem T68. It states that:

$$(A \subseteq B \wedge C \subseteq D) \Rightarrow (A \cap C \subseteq B \cap D)$$

(100 points)