<u>Suggested Set Questions from Old Foundation Exams</u>

Fall 2012) (15 pts) PRF (Sets)

Let A, B and C be finite sets of integers. Prove or disprove the following assertions:

a) If $C \subseteq A \cap B$, then $A - B \subseteq A - C$.
b) If $A \cap B \subseteq C$, then $(A - C) \cup (B - C) \cup (A \cap B) = A \cup B$.

Fall 2013) (10 pts) PRF (Sets)

Let A, B and C be finite sets of integers. If A ∩ B = A ∩ C and $\bar{A} \cap B = \bar{A} \cap C$, prove that B = C.

Spring 2014) (15 pts) PRF (Sets)

Prove or disprove the following assertion about finite sets A and B:

$$P(A) \cap P(B) = P(A \cap B)$$

Recall that *P(A)* is simply the set of all subsets of A.

Fall 2014) (15 pts) PRF (Sets)

Prove the following statement is true:

Let A, B and C be three finite sets. Prove that $(A - B) - C \subseteq A - (B - C)$.

(Note: $-$ denotes differences of two sets.)

Suggested Relation Questions from Old Foundation Exams

Spring 2013) (15 pts) PRF (Relations)

Let R be a relation over the positive integers greater than 1 defined as follows: R = { (x, y) | gcd(x,y) > 1, namely, x and y share a common factor.} Determine, with proof, whether or not R satisfies the following properties: (i) reflexive, (ii) irreflexive, (iii) symmetric, (iv) anti-symmetric, (v) transitive.

Summer 2014) (10 pts) PRF (Relations)

Consider the following relation R, between UCF students:

R = { (x, y) | there exists some instructor z such that both x and y have taken classes from z }

We define a UCF student to be anyone who has taken at least one class from an instructor at UCF.

With proof, determine which of the following properties R satisfies:

(a) reflexive, (b) irreflexive, (c) symmetric, (d) anti-symmetric, and (e) transitive.

Spring 2015) (15 pts) PRF (Relations)

Let R, S and T be relations and A, B and C be finite sets with $R \subseteq A \times B$, $S \subseteq A \times B$, and $T \subseteq B \times C$. Prove that $T \circ R \cup T \circ S = T \circ (R \cup S)$. (Note, we define the compositions of two relations $S \circ R$ to mean applying R, followed by applying S.)

Summer 2015) (10 pts) PRF (Relations)

(a) (5 pts) Let A = {1, 2, 3, 4}, B = {x, y, z} and C = {m, n}. Let R = {(1, x), (1, z), (2, y), (4, x), (4, y), (4, z)} and S = {(x, m), (y, m), (y, n)}. What is $S \circ R$?

(b) (5 pts) Let A = {1, 2, 3}. There are 5 equivalence relations over $A \times A$. Explicitly list all five.