Ma2201/CS2022
Quiz 0001

Foundations of C.S.

Spring, 2021

PRINT NAME: _____

$\mathcal{SIGN}$: _____

1. Let $A = \{1, 2, 3\}$, $B = \{1, 3, 5\}$ and $C = \mathcal{P}(A \cap B)$.

   a) (1 **pt**) List all the elements of $A \cup (B \cap C)$.

   b) (1 **pt**) List all the elements of $(\mathcal{P}(A) \cap C) \times (A \cap B)$.

   c) (1 **pt**) List all the elements of $\mathcal{P}(A) \cap \mathcal{P}(B) \cap \mathcal{P}(A \cup B)$.

   d) (2 **pt**) Define an onto function, f, with domain $A \times B$ and target C.

   e) (2 **pt**) Define an onto function with domain A and target $A \times A$ which is not one-to-one.

2. Define a relation X on $\mathbb{N}$, $X \subseteq \mathbb{N} \times \mathbb{N}$, by setting $(n, m) \in X$ if there is a number $k \in \mathbb{N}$ with

$$\min(n, m) \leq k^2 \leq \max(n, m)$$

If you prefer algebra, this is just the same:

$$\frac{n + m}{2} - \frac{|n - m|}{2} \leq k^2 \leq \frac{n + m}{2} + \frac{|n - m|}{2}$$

   a) Explain briefly why, or why not, X is reflexive.

   b) Explain briefly why, or why not, X is symmetric.

   c) Explain briefly why, or why not, X is transitive.