Name: _____     Student ID:

# Math 166 - Theory of Computability - Fall 1999

## Quiz #1 — October 7

1. Write out these sets explicitly (by listing all their elements **with no duplication**). $\mathcal{P}(X)$ denotes the powerset of $X$. Use $(x, y)$ notation for ordered pairs. "$-$" is "set minus". "$\emptyset$" denotes the empty set.

   (a) $\mathcal{P}(\emptyset)\ =$

   (b) $\mathcal{P}(\{1, 1, 2\})\ =$

   (c) $\{1, 3\} \times \{1, 2\}\ =$

   (d) $(\{1, 2\} \cap \{2, 3\}) - \{1, 3\}\ =$

   (e) $(\{1, 2\} - \{2, 3\}) \cup \{1, 2\}\ =$

   (f) $\mathcal{P}(\{1, 2\}) - \{1, \{2\}\}\ =$

2. Indicate whether the statements are true or false:

   ____(a) $\emptyset \subseteq \mathcal{P}(\{1, 2\})$.

   ____(b) $\emptyset \in \mathcal{P}(\{1, 2\})$.

   ____(c) $1 \in \mathcal{P}(\{1, 2\})$.

   ____(d) For all sets $A$, $A \in \mathcal{P}(A)$ only if $A$ is empty.

   ____(e) If cats can fly, then birds can fly.

   ____(f) Birds can fly only if cats can fly.

   ____(g) Horses can fly only if cats can fly.

3. Describe the following sets as simply as you can: ($\mathbb{N}$ is the set of non-negative integers.)

   (a) $\{n \in \mathbb{N} : n \geq k \text{ for some } k \text{ in } \mathbb{N}\}$

   (b) $\{n \in \mathbb{N} : n \geq k \text{ for all } k \text{ in } \mathbb{N}\}$