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**MH1812 Discrete Mathematics: Quiz (CA) 1**

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Name:

Tutorial Group:

NTU Email:

*There are 3 (THREE) questions, please try all of them, and justify all your answers! Best of luck!*

**Question 1** (40 points)

- a) Compute the addition table for integers modulo 3 (10 points).
- b) Compute  $7 \cdot 8 \cdot 9 \cdot 10$  modulo 3 (10 points).
- c) Show by direct proof that  $n^3 - n$  is always divisible by 3, for  $n$  any positive integer (20 points).

**Question 2** (40 points)

- a) Prove or disprove the following statement (20 points):

$$(p \wedge q) \rightarrow p \equiv T.$$

- b) Decide whether the following argument is valid (20 points):

$$\begin{array}{l} \neg d \rightarrow h; \\ \neg h \rightarrow d; \\ \therefore \neg d \vee \neg h \end{array}$$

**Question 3** (20 points)

Consider the domains  $X = \{2, 3\}$  and  $Y = \{2, 4, 6\}$ , and the predicate  $P(x, y) = "x \text{ divides } y"$ . What are the truth values of these statements:

- a)  $\exists x \in X, \forall y \in Y, P(x, y)$  (10 points).
- b)  $\neg(\exists x \in X, \exists y \in Y, P(x, y))$  (10 points).