MH1812 Discrete Mathematics: Quiz (CA) 1

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 (30 points)

a) Compute 40^{1234} modulo 2 (10 points).

b) Consider the set S of odd natural numbers, with respective operator Δ.

- Let Δ be the multiplication. Is S closed under Δ? Justify your answer (10 points).
- Let Δ be the addition. Is S closed under Δ? Justify your answer (10 points).

Question 2 (40 points)

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

$$p \wedge (\neg(q \rightarrow r)) \equiv (p \rightarrow r).$$

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

$(p \vee q) \rightarrow \neg r$;
$\neg r \rightarrow s$;
p;
$\therefore s$

Question 3 (30 points)

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

a) $\forall x \in X,\ \exists y \in Y,\ P(x, y)$ (15 points).

b) $\neg(\forall x \in X,\ \forall y \in Y,\ P(x, y))$ (15 points).