MATH1061 — DISCRETE MATHEMATICS
First Semester Examination, June 2001 (continued)

2. (a) **(4 marks)** Determine whether the following argument is valid. Please show your working, and let
s denote "today is Sunday"
e denote "I do have an exam"
ℓ denote "I am lucky".

If today is Sunday, then I do not have an exam.
If I do not have an exam, then I am lucky.
I am lucky and today is not Sunday.
Therefore I do have an exam.

The argument is [ ] (insert either *valid* or *invalid*).

(b) **(3 marks)** Give the negation of

$$(\forall x \in \mathbb{R})(\exists y \in \mathbb{R}) \quad \text{such that} \quad xy > 0.$$

Is the original statement true or false? (Write *true* or *false* in the box.)

The original statement is [ ]

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3. **(9 marks)** Let $T = \{\emptyset\}$, $Q = \{T\}$, $R = \{T, \emptyset\}$, $S = \{T, Q, R\}$. (Here $\emptyset$ denotes the empty set and $\mathcal{P}(X)$ denotes the power set of X.)

(a) True or false? (*Write true or false in the boxes.*)

(i) $Q \subseteq R$

(ii) $R \subseteq S$

(iii) $\emptyset \in T$

(iv) $\emptyset \subseteq T$

(b) Write the following *sets* in the boxes provided, and remember your braces { ... }.

(i) $T \cup Q =$	
(ii) $T \cap R =$	
(iii) $T - R =$	
(iv) $\mathcal{P}(T) =$	
(v) $|\mathcal{P}(Q)| =$	
(vi) $S \cup R =$	
(vii) $T \times Q =$	