Please write your answer to each question only in the box marked **Answer**.
No questions will be answered by the instructors during the exam.

**This is a closed-book exam. No computers or calculators are allowed.**

If you are unsure of what is wanted for a particular question, make a reasonable assumption and write this at the beginning of your answer.

NAME: ____________________________  SECTION: ___________

STUDENT NUMBER: ________________

FOR INSTRUCTOR’S USE ONLY

Question 1: _____ / 10

Question 2: _____ / 10

Question 3: _____ / 10

Question 4: _____ / 10

TOTAL: _____ / 40
Question 1: [10 marks]

Provide a formal proof to show that the following is a sound argument. Provide a dictionary for any predicate or constant symbols used.

Any Greek bearing gifts is feared by Plato
Aristotle is Greek
Therefore: Aristotle bearing gifts would be feared by Plato.

Answer:
Question 2: [10 marks]

Prove the validity of the sequent

$$\forall x(P(x) \rightarrow Q(x)), \exists x \neg Q(x) \vdash \neg \forall x P(x)$$

Answer:
Question 3: [10 marks]

Using the predicates:
L(x,y): x likes y
C(x): x is a course
F(x): x is female student
M(x): x is male student
and the unary function symbols (constants)
m: mathematics
l: logic
t: tom
s: susan

translate the following into predicate logic:

Answer:

(a) Susan likes every course that Tom dislikes.

(b) There is a female student who likes mathematics but does not like logic.

(c) All male students like some course.

(d) Everyone likes someone who likes themselves.
Question 4: [10 marks]

Give a formal proof of the following valid argument. Justify each step of the proof:

Premises:
1. \( \forall x(P(x) \rightarrow S(x)) \)
2. \( \forall xR(x) \)
3. \( \forall x(R(x) \rightarrow (P(x) \lor S(x))) \)

Conclusion:
\( \forall x(S(x)) \)

Answer: