

CSE 20: Discrete Mathematics

Spring Quarter 1998

Solutions for Quiz #2 - April 15, 1998

1. Rewrite the following statements formally using quantifiers and variables.

- a. Somebody is at least as tall as everybody.
 \exists a person p such that \forall people q , p is at least as tall as q .
- b. There is a book that everyone has read.
 \exists a book b such that \forall people q , q has read b .

2. Negate the following statements.

- a. $\forall x \in \mathbf{R} \exists y \in \mathbf{R}$ such that $x * y = 1$
 $\exists x \in \mathbf{R}$ such that $\forall y \in \mathbf{R}$, $x * y \neq 1$
- b. $\exists m \in \mathbf{N}$ such that $\forall n \in \mathbf{N}$, $m > n$
 $\forall m \in \mathbf{N} \exists n \in \mathbf{N}$ such that $n \geq m$

3. Give the contrapositive, converse and inverse of the following statement:

\forall packages p , if p was opened then the seal of p is broken.
(Be careful, there will be no partial credit on this problem.)

Contrapositive:

\forall packages p , if the seal of p is not broken, then p was not opened.

Converse:

\forall packages p , if the seal of p is broken, then p was opened.

Inverse:

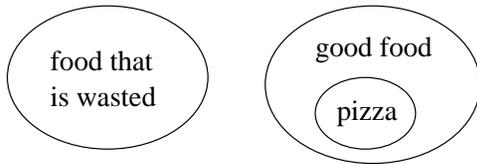
\forall packages p , if p was not opened then the seal of p is not broken.

4. State which of the following arguments are valid (by universal modus ponens or universal modus tollens) or invalid (converse or inverse error). Briefly justify your answer.

- a. For all students x , if x did good on the exam, then x gets a good grade.
Dawn did good on the exam.
 \therefore Dawn gets a good grade.
valid, universal modus ponens
- b. All honest students do not cheat on the exam.
Darth is not honest.
 \therefore Darth cheats on the exam.
invalid, inverse error

5. Is the following argument valid?
Justify your answer by drawing a diagram.

Pizza is good food.
No good food is wasted.
 \therefore No pizza is wasted.



The argument is valid.