CSC281: Discrete Math for Computer Science

Computer Science Department

King Saud University — Tutorial 2

1.

$T(x)$: x can learn new tricks.

U : old dogs

$\exists x\, T(x)$. Negation is: $\forall x \neg T(x)$: No old dogs can learn new tricks.

2.

let $C(x)$: x Know calculus.

U: Rabbits

$\neg\exists x\, C(x)$ Negation is: $\exists x\, C(x)$: There is a rabbit that Know calculus.

3.

$F(x)$: x can fly

U: birds

$\forall x F(x)$ Negation is $\exists x \neg F(x)$: There is a bird that can't fly.

4.

$F(x)$: x Knows french , $R(x)$: x Know Russian.

U: people In this class

$\forall x (F(x) \vee R(x))$ Negation is: $\exists x (\neg F(x) \wedge \neg R(x))$

There is someone who doesn't Know French nor Rusian.

Question 1. Identify the predicate functions in each of these s… then express each statement using quantifiers. Then form the neg… no negation is to the left of a quantifier. Next, express the negati… simply use the phrase It is not the case that.)

a) Some old dogs can learn new tricks.

b) No rabbit knows calculus. is not $-\forall x\, p(x)$ is correct?

c) Every bird can fly.

d) Everyone in the class knows French or Russian.

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$A \subset B \rightarrow$ الأكبر

Question 2. Let F(A) be the predicate A is a finite set and S(A,B) be the predicate A is contained in B. Suppose the universe of discourse consists of all sets. Translate the statement into symbols.

or $\neg\forall A\, F(A)$

is finite — A is subset

a) Not all sets are finite. $\exists A \neg F(A)$

b) Every subset of a finite set is finite. $\forall A \forall B [F(B) \wedge S(A,B) \rightarrow F(A)]$

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c) No infinite set is contained in a finite set. $\neg[\exists A \exists B (\neg F(A) \wedge S(A,B) \wedge F(B)]$

d) The empty set is a subset of every finite set. $\forall A [F(A) \longrightarrow S(\phi, A)]$

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Question 3. Translate each of these statements into logical expressions using predicates, quantifiers, and logical connectives.

$F(x)$: x is friend U: people

$P(x)$: x is perfect

a) No one is prefect. $\neg\exists P(x)$

b) Not everyone is perfect. $\neg\forall(x)\, P(x)$ OR $\exists x \neg P(x)$

c) All your friends are perfect. $\forall x (F(x) \rightarrow P(x)]$

d) At least one of your friends is perfect. $\exists x (F(x) \wedge P(x))$

Question 4. Let P(x), Q(x) and R(x) be the statements "x is a professor, " "x is ignorant, " and "x is vain, " respectively. Express each of the following statements using quantifiers; logical connectives; and P(x), Q(x) and R(x), where the universe of discourse is the set of all people.

a) No professors are ignorant. $\forall x (P(x) \rightarrow \neg Q(x))$

b) All ignorant people are vain. $\forall x (Q(x) \rightarrow R(x))$

c) No professors are vain. $\forall x \quad (P(x) \longrightarrow \neg R(x))$

d) Does (c) follow from (a) and (b)? If not, is there a correct conclusion?

The conclusion does not Follow. There may be vain professor, since the premises do not rule out the possibility that there are other vain people besides ignorant ones.

For all

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