

Lecture 7

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Q14. Translate in two ways each of these statements into logical expressions where domain consists of

$C(x)$: x has cellular phone

$M(x)$: x has seen foreign movie

$S(x)$: x can swim.

$Q(x)$: x can solve quadratic eq

$P(x)$: x is student in your class.

(i) students in your class.

(ii) all people

(A) Everyone in your class has cellular phone

$$\forall x C(x)$$

$$\forall x (P(x) \rightarrow C(x))$$

(B) Somebody in your class has seen a foreign movie.

$$\exists x M(x)$$

$$\exists x (P(x) \wedge M(x))$$

(C) There is a person in your class who cannot swim.

$$\exists x \neg S(x)$$

$$\exists x (P(x) \wedge \neg S(x))$$

(D) All students in your class can solve quadratic equations.

$$\forall x Q(x)$$

$$\forall x (P(x) \rightarrow Q(x))$$

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

- No one is perfect.
- Not everyone is perfect.
- All your friends are perfect.
- At least one of your friends is perfect.
- Everyone is your friend and is perfect.
- Not everybody is your friend or someone is not perfect.

$P(x)$: x is perfect
 $F(x)$: x is your friend.

$$(a) \forall x \neg P(x) \equiv \neg \exists x P(x)$$

Not all / none

Not all / none
some / \emptyset

$$(b) \neg \forall x P(x) \equiv \exists x \neg P(x)$$

$$(c) \forall x (F(x) \rightarrow P(x))$$

$$(d) \exists x (F(x) \wedge P(x))$$

$$(E) \forall x F(x) \wedge P(x)$$

$$(F)$$

$$\neg \forall x F(x) \vee \exists x \neg P(x)$$

(F) Not everybody is your friend and perfect.

$$\neg \forall x (F(x) \wedge P(x))$$

$$\exists x \neg F(x) \vee \neg P(x)$$

Introduction To Proofs

A proof can use the hypotheses of the theorem, if any, axioms assumed to be true, and previously proven theorems.

Theorem: A theorem may be the universal quantification of a conditional statement with one or more premises and a conclusion.

Proposition: Less important theorems are called propositions.

Proof: A proof is a valid argument that establishes the truth of a theorem.

Lemma: A less important theorem that is helpful in the proof of other results is called a lemma.

Corollary: It is a theorem that can be established directly from some theorem that has been already proved.

Conjecture: It is a statement that is being proposed to be true on the basis of some partial evidence or the intuition of an expert.

