M260 3.1, 3.2

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Predicates and Quantified Statements

A _________________ is a sentence that contains a finite number of _______________

and becomes a statement when specific values are substituted for the ________________.

The domain of a __________________ ______________ is the set of all values that may

be substituted in place of the _________________.

Consider the predicate P, "--- is a student at ---". P(x,y) becomes "x is a student at y".

The ______________ of the first variable, x, is the set of _______________ and the

______________ of the second variable y is the set of _________________.

P(x,y) is not a statement because it ____.

P(Iliana, Southwestern College) is the statement _____________________ _______

___________________________ _____________. P(Iliana, Stanford) is the statement

____________________________ __________________________.

If Q(x) is a ____________________ and x has ___________________ D, then the truth

set of _______ is the set of elements of _____ that make Q(x) ________ when

substituted for x.

The truth set of Q(x) is denoted

$$\{x \in D \mid Q(x)\}$$

which is read: "____."

Let P(x) and Q(x) be ___________________ and suppose the common domain of x is D.

The notation $P(x) \Rightarrow Q(x)$ means that ____

____________________________________ ____. The notation $P(x) \Leftrightarrow Q(x)$ means that

_________________________________ _________________________________.

To change a predicate into a statement we can assign values to the __________________ .

Another way to obtain statements from predicates is to add ________________.

The symbol ∀ denotes "________________" and is called the _______________

______________. Examples: "∀ human beings x, x is mortal" or "∀ x ∈ (the set of human beings), x is mortal".

Let Q(x) be a predicate and D the ___________ of x. A universal statement is a statement of the form "_________________________________." It is defined to be true ______________________ ______________ ______________. It is defined to be false _____________ _______ _____________________________. A value of x for which Q(x) is false is called a _________________________. The method of _________________________ consists of showing the truth of the predicate separately for each individual element of the domain.

The symbol ∃ denotes "________________" and is called the _______________

______________. Example: "∃ a person s such that s is passing Math 260 this semester". Let Q(x) be a predicate and D the ___________ of x. An existential statement is a statement of the form "_________________________________." It is defined to be true __________________________________ _______________________ _________.

It is defined to be false _________ ______ _______________________________________.

The universal conditional statement has the form

____.

Write the following as formal universal conditional statements:

a. If a real number has a terminating decimal representation then it is a rational number.

____.

b. All students are hard workers.

____.

c. There are no bad teachers at Southwestern College.

____.

The negation of a statement of the form: $\forall x$ in D, Q(x)

is logically equivalent to a statement of the form

____.

Symbolically: $\sim(\forall x \in D, Q(x)) \equiv$ _______________________________.

The negation of a universal statement ("all are") is logically equivalent to an existential statement ("some are not").

The negation of a statement of the form: $\exists x$ in D such that Q(x)

is logically equivalent to a statement of the form

____.

Symbolically: $\sim(\exists x \in D$ such that $Q(x)) \equiv$ _______________________________.

The negation of an existential statement ("some are") is logically equivalent to a universal statement ("all are not").

Give the formal negation of the statement: $\forall$even integers n, n^2 ? n.

____

Give the formal negation of the statement: $\exists$ a student s such that s does not have an email account.

____

The negation of the universal quantifier is given as

$\sim(\forall x$, if $P(x)$ then $Q(x)) \equiv$ __________ __________________ __________

or symbolically

$\sim(\forall x, P(x) \rightarrow Q(x)) \equiv$ ______ ___________________ ______________

Write a formal negation for: $\forall$student s, if s filled out the notes sheet for exam one then s got at least a C on exam one. ______________________________________

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_______________ ___________________________ ______________ .