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CS-225: Discrete Structures in CS
Homework 2, Part 1
Exercise Set 3.1: Question # 16, 17, 18, 23, 24, 28; Set 3.2: Question # 2, 4

16.

a) $\forall$ *dinosaurs* x, x *is extinct*
b) $\forall$ *real numbers* x, x *is positive, negative,* or *zero*
c) $\forall$ *irrational numbers* x, x *is not an integer*
d) $\forall$ *logicians* x, x *is not lazy*
e) $\forall$ *integers* x, x^2 *is not equal* to 2,147,581,953
f) $\forall$ *real numbers* x, x^2 *is not equal* to -1

17.

a) $\exists$ *an exercise* x, *such that* x *has an answer*
b) $\exists$ *a real number* x, *such that* x *is rational*

18.

a) $\exists s \in D$, *such that* $E(s)$ and $M(s)$
b) $\forall s \in D$, *if* $C(s)$ *then* $E(s)$
c) $\neg(\exists s \in D$, *such that* $C(s)$ and $E(s))$
d) $\exists s \in D$, *such that* $C(s) \wedge M(s)$
e) $(\exists s \in D$, *such that* $C(s) \wedge E(s)) \wedge (\exists s \in D$, *such that* $C(s) \wedge \neg E(s))$

23.

a) $\forall$ x, *if* x *is an equilateral triangle, then* x *is an isosceles*.
$\forall$ *equilateral triangles* x, x *is an iscoceles*.
b) $\forall$ x, *if* x *is a computer science student, then* x *needs* to *take data structures*.
$\forall$ *computer science students* x, x *needs* to *take data structures*.

24.

a) $\exists$ *a hater* x, *such that* x *is mad*.
$\exists x$, *such that* x *is a hatter* and x *is mad*.
b) $\exists$ *a question* x, *such that* x *is easy*.
$\exists x$, *such that* x *is a question* and x *is easy*.

28.

a) 0 is a positive real number. This is false. By definition, a positive real number is any number x, where x > 0. 0 is not greater than 0, so this statement is false.
b) If a number is real and negative, then its negative value is positive real number. This is true. Let our real negative number x be equal to -2. (a particular yet arbitrarily chosen negative real number) When we calculate the negative value of x, we get -x=-(-2). By the double negative law, -x is a positive real number.
c) If a number is an integer, then it is a real number. This is true. By definition, $\mathbb{Z}$ *is a* subset *of* $\mathbb{R}$
d) There is a number that is real and not an integer. This is true. Take ½ for example. It is a real number and not an integer. All integers are real numbers but not all real numbers are integers.

2.

a) No
b) No
c) Yes
d) No
e) No
f) Yes
g) No
h) No

4.

a) Some dogs are unfriendly.
b) Some people are unhappy.
c) All suspicions were unsubstantiated.
d) All estimates are inaccurate.