第二次离散数学作业

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Let C(x) be the propositional function "x" is in your class.

1.1 a

Let M(x) be the propositional function "x" has a mobile phone.
(1)$\forall x M(x)$
(2)$\forall x(C(x) \wedge M(x))$

1.2 c

Let S(x) be the propositional function "x" can swim.
(1)$\exists x \neg S(x)$
(2)$\exists x(C(x) \wedge \neg S(x))$

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2.1 a

Let V(x) be the propositional function "x" qualifies as a vip. Let F(x,y) be the propositional function "x" flys more than "y" miles a year. Let N(x,y) be the propositional function "x" flys more than "y" times a year.
$\forall x((F(x, 25000) \vee N(x, 25)) \rightarrow V(x))$

2.2 b

Let M(x) be the propositional function "x" is male. Let T(x,y) be the propositional function "x" is able to finish a marathon in less than y hours. Let Q(x) be the propositional function "x" is qualified for the marathon.
$\forall x(((M(x) \wedge T(x,3)) \vee (\neg M(x) \wedge T(x,3.5))) \rightarrow Q(x))$

2.3 c

Let Q(x) be the propositional function "x" is qualified for a master's degree. Let B(x) be the propositional function "x" gets higher than B in every subject. Let S(x,y) be the propositional function "x" gets more than "y" credits. Let P(x) be the propositional function "x" passed the master thesis defense.
$\forall x((B(x) \wedge (S(x,60) \vee (S(x,45) \wedge P(x)))) \rightarrow Q(x))$

2.4 d

Let V(x) be the propositional function "x" has learned 21 credit course in a term. Let A(x) be the propositional function "x" got A for all course. Let S(x) be the propositional function "x" is a student.
$\exists x(S(x) \wedge (V(x) \wedge A(x)))$

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They are not equivalent. For example, if P(x) is sometimes true and sometimes false, then $\forall x(P(x) \rightarrow Q(x))$ is false but $\forall x P(x) \rightarrow \forall x Q(x)$ is true.

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4.1 a

$\forall x(P(x) \rightarrow \neg S(x))$

4.2 b

$\forall x(R(x) \rightarrow S(x))$

4.3 c

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

4.4 d

$\forall x(Q(x) \rightarrow \neg R(x))$

4.5 e

Yes, we can. From (a) and (c), we know that $\forall x(Q(X) \rightarrow \neg S(x))$. But according to (b), $\forall x(R(x) \rightarrow S(x))$. So $\forall x(Q(x) \rightarrow \neg R(x))$.