Practical 4 (weeks 7 - 8)

Theory Questions

1.Symbolize the following proposition and discuss the truth.

1. Everyone has black hair.
2. Some people boarded the moon.
3. No one has boarded Jupiter
4. Students studying in the US are not necessarily Asians.

your answer here...

1. False. $P(x)\Rightarrow BH(x)$, $BH(x)$ means x has black hair,$P(x)$ means x is a human.
2. True.$\exists x(P(x)\Rightarrow BM(x))$, $\exists x$ means there is someone x can satisfy $P(x)$ (x is a human) and $BM(x)$
3. True, $\neg x(P(x)\wedge BJ(x))$, $\neg x$ means no people can satisfy $P(x)$ (x is a human) and $BJ(x)$ (boarded the jupiter)
4. True, $\exists x(SU(x)!\Rightarrow A(x))$, $\exists x$ means there is someone x can satisfy $SU(x)$ (x studying in US) but not $A(x)$ (x is Asian)

2.Judge the following formula, which is tautology? What is the contradiction?

1. $\forall xF(x)\Rightarrow(\exists x\exists yG(x,y))\Rightarrow\forall xF(x))$
2. $\neg(\forall xF(x)\Rightarrow\exists yG(y))\wedge\exists yG(y)$
3. $\forall x(F(x)\Rightarrow G(y))$

your answer here...

1. Tautology
2. Contradiction
3. Neither

3.Which of the following are correct?

1. False $\models$True.
2. $(A \wedge B) \models (A \Leftrightarrow B)$.
3. $(A \wedge B) \Rightarrow C \models (A \Rightarrow C) \vee (B \Rightarrow C)$.

4. $(A \vee B) \wedge (\neg C \vee \neg D \vee E) \models (A \vee B)$.

5. $(A \vee B) \wedge (\neg C \vee \neg D \vee E) \models (A \vee B) \wedge (\neg D \vee E)$.

your answer here...

1. FALSE
2. TRUE
3. TRUE
4. TRUE
5. FALSE

4.Conjunctive normal form.link:https://baike.baidu.com/item/%E5%90%88%E5%8F%96%E8%8C%83%E5%BC%8F/2459360

1. Obtaining conjunctive paradigm: $P \wedge (Q \Rightarrow R) \Rightarrow S$

Basic steps to find a conjunctive normal form.

2. Cut redundant connectives，Reserved {∨， ∧， ¬}
3. Move or remove the negation ~
4. distribution rates

your answer here...

$(\neg P \vee S \vee Q) \wedge (\neg P \vee S \vee \neg R)$

5.Arithmetic assertions can be written in first-order logic with the predicate symbol <,the function symbols + and ×, and the constant symbols 0 and 1. Additional predicates can also be defined with biconditionals.(Chapter 8.20)

1. Represent the property "x is an even number."
2. Represent the property "x is prime."
3. Goldbach's conjecture is the conjecture (unproven as yet) that every even number is equal to the sum of two primes. Represent this conjecture as a logical sentence.

your answer here...

1. $\forall x \mathrm{Even}(x) \Leftrightarrow \exists y \Rightarrow x=y+y$
2. $\forall x \mathrm{Prime}(x) \Leftrightarrow \forall y,z \Rightarrow x=y\times z \Rightarrow y=1 \vee z=1$
3. $\forall x \mathrm{Even}(x) \Rightarrow \exists y,z \Rightarrow \mathrm{Prime}(y) \wedge \mathrm{Prime}(z) \wedge x=y+z$