Name:
Student ID:

CSED261: Discrete Mathematics for Computer Science
Homework 2: Logic and Proof

Question 1. For each of these sets of premises, what relevant conclusion or conclusions can be drawn? Explain the rules of inference used to obtain each conclusion from the premises.

1. "If I play hockey, then I am sore the next day." "I use the whirlpool if I am sore." "I did not use the whirlpool."
2. "If I work, it is either sunny or partly sunny." "I worked last Monday or I worked last Friday." "It was not sunny on Tuesday." "It was not partly sunny on Friday."
3. "All insects have six legs." "Dragonflies are insects." "Spiders do not have six legs." "Spiders eat dragonflies."
4. "Every student has an Internet account." "Homer does not have an Internet account." "Maggie has an Internet account."
5. "All foods that are healthy to eat do not taste good." "Tofu is healthy to eat." "You only eat what tastes good." "You do not eat tofu." "Cheeseburgers are not healthy to eat."
6. "I am either dreaming or hallucinating." "I am not dreaming." "If I am hallucinating, I see elephants running down the road."

Solutions

Question 2. Determine whether these are valid arguments.

1. If x is a positive real number, then x^2 is a positive real number. Therefore, if a^2 is positive, where a is a real number, then a is a positive real number.
2. If $x^2 \neq 0$, where x is a real number, then $x \neq 0$. Let a be a real number with $a^2 \neq 0$; then $a \neq 0$.

Solutions

Question 3. Prove that if n is an integer and $3n + 2$ is even, then n is even using

1. a proof by contraposition.
2. a proof by contradiction.

Solutions

Question 4. Show that at least three of any 25 days chosen must fall in the same month of the year.

Solutions

Question 5. Prove that given a real number x there exist unique numbers n and ϵ such that $x = n + \epsilon$, n is an integer, and $0 \leq \epsilon < 1$

Solutions

Question 6. Prove that between every rational number and every irrational number there is an irrational number.

Solutions