

CSE 150 Fall 2009: Homework #1

Note: If you don't know the proper notation for something, just describe it as well as you can.

Problem 1

Write down the truth tables for the following expressions.

1. $(\neg P \wedge (Q \Rightarrow P)) \Rightarrow \neg Q$
2. $P \vee (Q \Leftrightarrow R)$

Problem 2

Each of the following statements is false. Prove it.

1. $\exists x \in \mathbb{R}.\forall y \in \mathbb{R}.xy = 1$
2. $\forall p \in \mathbb{N}.p \text{ is prime} \Rightarrow 2^p - 1 \text{ is prime}$
3. $\exists x \in \{0, 1\}.(x + 1)^2 \not\equiv (x^2 + 1) \pmod{2}$

Problem 3

Compute the greatest-common divisor of 1000288896 and 768462011.

Problem 4

Prove that $a \equiv b \pmod{n}$ if and only if $(a \bmod n) = (b \bmod n)$.

Problem 5

Implement the extended Euclidean algorithm in 30 lines of code or less. Your function should take two inputs, a and b , and should return three integers, s , t , and g , where $g = \gcd(a, b)$ and $sa + tb = g$. For simplicity, you may assume that a and b are positive integers and that $a \leq b$.