Problem Set 2   Foundations   Due 1/26/2007

Four of these problems will be graded, with each problem worth 5 points. Clear and complete justification is required for full credit. You are welcome to discuss these problems with anyone and everyone, but must write up your own final submission without reference to any sources other than the textbook and instructor. Submissions must be on clean paper with no ragged edges.

1. Determine whether the propositionals $P \wedge (Q \vee R)$ and $(P \wedge Q) \vee (P \wedge R)$ are equivalent.

2. Determine whether the propositionals $P \Rightarrow (Q \vee R)$ and $(P \Rightarrow Q) \vee (P \Rightarrow R)$ are equivalent.

3. $\sqrt{3}$ is irrational.

4. The product of a rational with an irrational number is always irrational.

5. For any $n \in \mathbb{N}$, $\displaystyle\sum_{r=1}^{n} (2r - 1) = n^2$.

6. Critique the following "proof":

> Proposition: $2 = -2$
> Proof: Well, we want to show that $2 = -2$. We square both sides to get $(2)^2 = (-2)^2$, which is the same as $(2)(2) = (-2)(-2)$, or just $4 = 4$ since the product of two negatives makes a positive. But we know $4 = 4$ is true because it has the same thing on both sides. ❑