Problem Set 2 Foundations Due 1/25/2008

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 $\neg(P \Rightarrow (Q \wedge R))$ and $\neg(P \Rightarrow Q) \vee \neg(P \Rightarrow R)$ are equivalent.

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

3. The sum of a rational and an irrational number is irrational.

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

5. For $n \geq 4$, $n! \geq 2^n$.

6. Critique the following "proof"

   Proposition: If n is an integer for which n^2 is throdd, then n is throdd.

   Proof: Well, let n be a throdd integer. Then by definition $n = 3m + 1$ for some integer m. But then $n^2 = (3m + 1)^2 = 9m^2 + 6m + 1 = 3(3m^2 + 2m) + 1$, but since $3m^2 + 2m$ is itself an integer (by the closure of the integers under multiplication and addition), then this shows n^2 is throdd also. $\square$