

Quiz 4 Solutions

CE16 W15

Larrabee

Sam Mansfield

1. (5 points¹) Give a formal proof of this statement: $[(p \rightarrow q) \wedge (\neg p \rightarrow q)] \rightarrow q$. List your steps and the justification for each step.

$(p \rightarrow q) \wedge (\neg p \rightarrow q)$	1. Hypothesis 1
$(\neg p \vee q) \wedge (p \vee q)$	2. Definition of Implication
$q \vee q$	3. Resolution of 2
q	4. Idempotent Law of 3

2. (5 points²) Prove that $\sqrt{2}$ is irrational by giving a proof by contradiction. Recall that if a number is rational, it can be expressed, it can be expressed as a ratio a/b such that $\gcd(a, b) = 1$.

Assume $\sqrt{2}$ is rational.

$\sqrt{2} = a/b$, where $a, b \in \mathbb{Z}$ and $\gcd(a, b) = 1$

$$2 = a^2/b^2$$

$2b^2 = a^2$ therefore a is even and can be re-written as $a = 2c$, where $c \in \mathbb{Z}$

$$2b^2 = 4c^2$$

$b^2 = 2c^2$ therefore b is even

$\gcd(a, b) \neq 1$ therefore $\sqrt{2}$ is irrational.

¹Mistakenly listed as 4 points on the quiz

²Mistakenly listed as 4 points on the quiz