

Mini-Quiz Feb. 17

Your name: _____

- This quiz is **closed book**. Total time is 25 minutes.
- Write your solutions in the space provided. If you need more space, write on the back of the sheet containing the problem. Please keep your entire answer to a problem on that problem's page.
- GOOD LUCK!

DO NOT WRITE BELOW THIS LINE

Problem	Points	Grade	Grader
1	5		
2	10		
3	5		
Total	20		

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Problem 1 (5 points).

Prove that $\log_4 9$ is irrational. Your proof should be clear and well-organized, and should explicitly indicate where particular properties of primes are assumed.

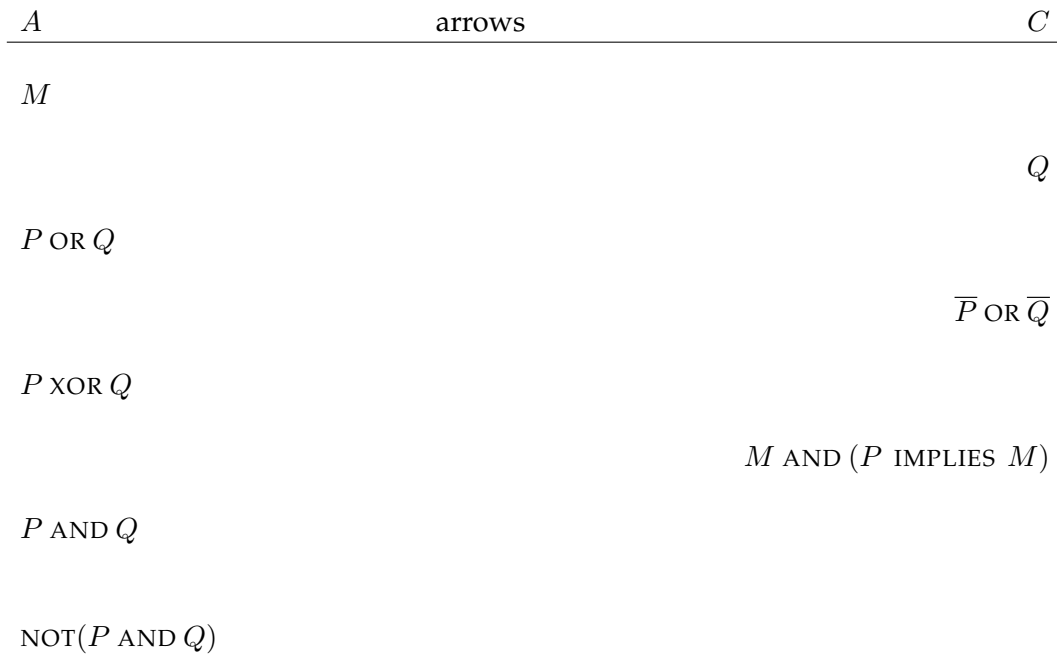
Problem 2 (10 points).

Let A be the set of five propositional formulas shown below on the left, and let C be the set of three propositional formulas on the right. Let R be the “implies” binary relation from A to C which is defined by the rule

$$F R G \text{ iff [the formula } (F \text{ IMPLIES } G) \text{ is valid].}$$

For example, $(P \text{ AND } Q) R P$, because the formula $(P \text{ AND } Q)$ does imply P . Also, it is not true that $(P \text{ OR } Q) R P$ since $(P \text{ OR } Q)$ does not imply P .

(a) Fill in the arrows so the following figure describes the graph of the relation, R :



(b) Circle the properties below possessed by the relation R :

FUNCTION TOTAL INJECTIVE SURJECTIVE BIJECTIVE

(c) Circle the properties below possessed by the relation R^{-1} :

FUNCTION TOTAL INJECTIVE SURJECTIVE BIJECTIVE

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Problem 3 (5 points).

Prove by the Well Ordering Principle that for all nonnegative integers, n :

$$\sum_{i=0}^n i^3 = \left(\frac{n(n+1)}{2} \right)^2.$$

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