

Howard University Math Department

Instructions:

PLEASE PROVIDE STEP BY STEP EXPLANATIONS

WRITING ONLY ANSWERS WILL NOT GET FULL CREDIT

Time Limit 30 minutes

Please read the questions carefully before answering

1. (10 points) State the converse, contrapositive and negative of the following statement:

If a natural number is a prime number, then it has only two divisors.

[JUST FYI: You need not know what a prime number is.

The two divisors are 1 and the number itself].

2. (10 points) Check the validity of the following argument: (You only need to check if the conclusion follows from the first statement based on the argument. Initial statement might be true or false)

If you play by the rules, then you will succeed.

You did not succeed.

Therefore you must not have played by the rules

3. (10 points) Write the following symbolic statement in words. If it is false, prove by counterexample. The domain of discourse is $\mathbb{Z}$, the set of integers. $P(x)$ means $x > 0$, and $Q(x)$ means $\sqrt{x} \in \mathbb{Z}$.

$$\forall x, (P(x) \implies Q(x))$$