Math 3345

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QUIZ # 2

Name: . . . .

Class time: . . . .

Respond to *exactly two* of the following four problems on the blank paper given. Make sure that your name is on each sheet that you turn in, as well as a page number if you require multiple pages for a given problem. Each problem must be on a separate sheet; turn in each sheet to the appropriate pile. For each problem that involves writing a proof, you are to explicitly formulate a claim and then give a proof. Please read each problem carefully before attempting it. You must turn in this sheet and all scratch paper, but nothing will be graded unless you indicate to do so (*i.e.* you may use this sheet as scratch paper or to write a solution to one problem). Each of the problems is given equal weight in grading. Attempts at more than two problems will result in a random selection of two of your solutions being graded.

1. **Prove or Disprove.** Let a and b be positive integers and suppose that for every positive integer c that $a \equiv b \mod c$. Then $a = b$.

2. **Prove or Disprove.** Suppose that $x, y \in \mathbb{R}$ are such that both $x + y$ and xy are positive rational numbers. Then x and y are both rational numbers.

3. **Prove or Disprove.** For any integer x, the number $x^2 + x + 1$ is odd. (*You may assume that every integer is either even or odd.*)

4. **Definition.** Give the precise definition of the symbol $k|n$. Be sure to declare the variables k and n.