

**MATH201      MIDTERM 3**

**April 20**

**Name:** .....

Answer as many problems as you can. Show your work. An answer with no explanation will receive no credit.

GOOD LUCK!

Problem 1	Problem 2	Problem 3	Problem 4	Problem 5	Problem 6

Total score

**1:** There are five different equivalence relations on the set  $A = \{a, b, c\}$ . Describe them all. Diagrams will suffice. Recall that equivalence relation on  $A$  is the same thing as a partition of  $A$ .

*(This question is: good - bad - ugly? Difficulty: 0-9: )*

**2:** Solve the following set of equations over  $\mathbb{Z}_5$ .

$$4x + 2y + z = 2$$

$$x + 4y + 3z = 1$$

$$2x + y + 4z = 4$$

The result should be numbers from  $\mathbb{Z}_5$ , not fractions!

*(This question is: good - bad - ugly? Difficulty: 0-9: )*

**3:** Let  $f : \mathbb{R} \rightarrow \mathbb{R}$  and  $g : \mathbb{R} \rightarrow \mathbb{R}$ . Assume  $g \circ f$  is a bijective function. Is it true that  $f$  or  $g$  must be bijective?

(This question is: good - bad - ugly? Difficulty: 0-9: )

**4:** Prove or disprove: The set  $\mathbb{Q}^{100}$  is countably infinite.  
Recall that  $\mathbb{Q}$  is the set of rational numbers.

*(This question is: good - bad - ugly? Difficulty: 0-9: )*

**5:** Prove that the sequence  $\{\frac{4n-1}{3n}\}_{n=1}^{\infty}$  has limit  $\frac{4}{3}$  directly by using the definition of a limit.

*(This question is: good - bad - ugly? Difficulty: 0-9: )*

**6:** Prove that the sequence  $\{\frac{2n-1}{3n}\}_{n=1}^{\infty}$  is Cauchy by verifying that the sequence satisfies the definition of being Cauchy.

*(This question is: good - bad - ugly? Difficulty: 0-9: )*

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