**MATH 201 HW 10**

due **Apr 1** before class.

**Staple** all your papers. Write carefully, unreadable answers will not receive any credit. Write your opinion about every question - good - bad - ugly - (or some other) and difficulty.

Please write your section or time of your class on you HW.

**1:** Suppose $R$ is a symmetric and transitive relation on a set $A$, and there is an element $a \in A$ for which $aRx$ for every $x \in A$. Prove that $R$ is reflexive.
*(This question is: good - bad - ugly? Difficulty 0-9: )*

**2:** Find a relation that is reflexive but not symmetric and not transitive.
*(This question is: good - bad - ugly? Difficulty 0-9: )*

**3:** Define a relation $R$ on $\mathbb{Z}$ as $xRy$ if and only if $x^2 + y^2$ is even. Prove $R$ is an equivalence relation. Describe its equivalence classes.
*(This question is: good - bad - ugly? Difficulty 0-9: )*

**4:** List all partitions of the set $A = \{a, b, c\}$.
*(This question is: good - bad - ugly? Difficulty 0-9: )*

**5:** Write the addition and multiplication tables for $\mathbb{Z}_4$ and decide if $\mathbb{Z}_4$ is a field.
*(Hint: inverse elements must exist in fields. For curious students - there exists a finite field on 4 elements, but its construction is different.)*
*(This question is: good - bad - ugly? Difficulty 0-9: )*

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

$$\begin{aligned} x + 2y + 3z &= 3 \\ 2x + 2y + z &= 4 \\ 4x + y + 3z &= 1 \end{aligned}$$

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

**7:** Is the relation $\theta = \{((x, y), (3y, 2x, x + y)) : x, y \in \mathbb{R}\}$ a function? If so, what is its domain, codomain and range?
*(This question is: good - bad - ugly? Difficulty 0-9: )*

**8:** This question concerns functions $f : \{a, b, c, d, e\} \to \{1, 2, 3, 4, 5\}$. How many such functions are there? How many of these functions are injective? How many are surjective? How many are bijective?
*(This question is: good - bad - ugly? Difficulty 0-9: )*