MATH 310 Spring 2017   **Homework #5**   **Due Wednesday, February 22**

Please indicate how much time you spent on this assignment and give the name(s) of anyone you worked with.

1. Let $S = \{(a, b) \mid a, b \in \mathbb{Z} \text{ and } b \neq 0\}$. Let $(a, b) \sim (c, d)$ if and only if $ad = bc$. Prove that $\sim$ is an equivalence relation on S.

2. Section 2.1 #3

3. Section 2.1 #6

4. Section 2.1 #13

5. Section 2.1 #14

6. Section 2.1 #21

7. Section 2.2 #3

8. Section 2.2 #5

Challenge Problems

9. When 277, 343, and 618 are divided by a certain positive integer d (where $d > 1$), all three remainders are the same. What is the smallest possible value of d?

10. Recall that for $n \geq 1$, $n! = n \cdot (n-1) \cdots 2 \cdot 1$ and that $n! = n \cdot (n-1)!$. What is the remainder when

$$1! + 2! + 3! + 4! + 5! + 6! + \cdots$$

is divided by 9? [*Hint: You can solve this problem without calculating very many factorials.*]

Remember to write your solutions legibly on separate paper, put your name at the top of the first page, and staple your assignment before handing it in.