Math 2326 - Introduction to Abstract Mathematics
Assignment 13 - Due Monday, February 18

Problem 42′:

Define a relation $\sim$ on $\mathbb{Z} \times \mathbb{N}$ by $(a, b) \sim (c, d)$ if and only if $ad - bc = 0$. Prove, using only properties of integers (i.e. without introducing fractions), that this is a transitive relation.

Problem 47:

Let $f : \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = 3x + 7$. Prove that f is a bijection.

Your answers to problems 48 - 52 require no justification and may be written on the same page.

Problem 48:

Let $m, n \in \mathbb{N}$ and let X be a set with exactly m elements and let Y be a set with exactly n elements. If $f : X \to Y$ is an injection, which of the following may be true?

a. $n > m$.

b. $n = m$.

c. $n < m$.

d. There's no way to tell.

Problem 49:

Let $m, n \in \mathbb{N}$ and let X be a set with exactly m elements and let Y be a set with exactly n elements. If $f : X \to Y$ is a surjection, which of the following may be true?

a. $n > m$.

b. $n = m$.

c. $n < m$.

d. There's no way to tell.

Problem 50:

Let $m, n \in \mathbb{N}$ and let X be a set with exactly m elements and let Y be a set with exactly n elements. If $f : X \to Y$ is a bijection, which of the following may be true?

a. $n > m$.

b. $n = m$.

c. $n < m$.

d. There's no way to tell.

Problem 51:

Let $m, n \in \mathbb{N}$ and let X be a set with exactly m elements and let Y be a set with exactly n elements. If $f : X \to Y$ is neither an injection nor a surjection, which of the following may be true?

a. $n > m$.

b. $n = m$.

c. $n < m$.

d. There's no way to tell.

Problem 52:

Find a book in the library that includes an introductory discussion (i.e. suitable for an undergraduate) of one or more of the following topics: proof by induction, set theory, functions. Check the book out and bring it to class on Monday. On your assignment, write down the title of the book, the author's name, and which topic it includes.