Intro to Proofs Day 21 Outline (This class meets for 110 minutes.)

**Need: stuff to hand back, 6.4 (composition) WS,**

PART 1: Synthesis (0-10 minutes)

**Section 6.3 #9a f: RxR to RxR defined by f(x,y) = (2x,x+y)**

* Injection: f(a,b) = f(c,d) then (2a, a+b) = (2c, c+d). So 2a = 2c or a=c. Then a+b = c+d. Since a=c, then b=d.
* Surjection: Let (u,v) in RxR. Then (1/2 u, -1/2 u + v) in RxR. And f(1/2u, -1/2 u + v) = (2\*(1/2u), (1/2)u + (-1/2 u + v)) = (u,v)
* **What if domain and codomain were Z x Z?** Then is an injection, but not a surjection.

PART 2: Section 6.3 on Injections and Surjections [10-20 minutes]

**Page 4 of the Section 6.3**

* Students attempt to disprove surjection and disprove injection.

PART 3: Section 6.4 – Composition of Functions [20-50 minutes]

**Discuss Preview Activity:**

* Everyone did great! All the answers are right and you feel confident about them.

**Do example**

* F: Z to Z>=0 define by f(x) = x^2. Then G: Z>= 0 to {0,1,2} defined by g(z) = z (mod 3).
* What’s g(f(1)), g(f(2)), g(f(-5))?
* Draw arrow diagram
* What do you notice about domain/codomain of these functions?

**Worksheet 6.4 – page 1**

* Check first one with me, then find a partner and go to white board to try to do the second one.
* If f: A -> B, and g: B-> C and g(f(x)) is an injection, this does \*not\* mean g is an injection. Does f have to be an injection?

-----------------------------------------------BREAK----------------------------------------------------

Section 6.4 Worksheet page 2 [50-80 minutes]

**Worksheet 6.4 – page 2**

* Explore each of the 3 conjectures with their groups.
* Fill in the blank proofs.
  + Want to show that g(f(x)): A to C. is a surjection. So let c in C. Want to show there is an a in A that maps to c. Try to use that g and f are surjections now.
  + Want to show if g(f(x)): A to C is an injection then f is an injection. Suppose f(a) = f(b). The goal is to show a=b. Try to use that g(f(x)) is an injection now.

Section 6.5 Worksheet [80-110 minutes]

Hand out exams. No synthesis/preview for Monday. Just work on proof portfolio and exam.