Intro to Proofs Day 10 Outline (This class meets for 110 minutes.)

**Section 3.4 worksheet, synthesis to hand back, Quiz copies, Cards**

PART 1: Synthesis Stuff (0-15 minutes)

**Zombie Problem**

* Presentation of solution. Trying stuff.

**Section 3.2 #14a**

* There exist integers x and y such that 4x+6y=2. (Yes. Let x=-1, and y=1, then 4(-1) + 6(1) = 2).
* Follow up do there exist integers x and y such that 6x+15y=2? Something special about the left hand side coefficients.

**Section 3.3 Progress Check 3.18**

* Questions on the proof of Proposition 3.14? Where do they use that 0<x<1?
* (2m+1)^2 + (2n+1)^2 = (2k)^2. Factor out a 2 and cancel.

PART 2: More Proof by Contradiction for Non-existence (15-30 minutes)

**Section 3.3 Worksheet Activity 3**

* Work on in groups.
* Have someone present?

PART 3: Proof by Contradiction for Irrational Numbers (30-60 minutes)

**Discuss Preview Activity (30-35 minutes)**

* Slide 2: Proof by Contradiction that sqrt{2} is irrational questions:
  + Can we just state that a^2 is even then a is even? Yes if we’ve proved it before.
* Slide 2: What proof method should we use for a^2 is even then a is even?
  + Contrapositive (because can’t take a square root, last answer)
  + Contradiction? Note that in the second answer we haven’t reached a contradiction.
* Slide 3: Proving that sqrt{3} is irrational
  + 3b^2 = a^2… so 3 divides a^2…..so 3 divides a (this is the part that we haven’t shown).

**Activity 4 (35-60 minutes)**

* They work on the proof. Encourage them to think back to previous worksheets.
* If time: they should move on to the conjectures on the back page.

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

PART 4: Proof by Cases (70-90 minutes)

**Discuss more of the Preview Activity [ 70-75]**

* Slide 4: What’s P, Q, and R
* Slide 5:
  + What about 0?
  + What about rational numbers? How do we split those into cases?
  + When to use proof by cases? Not enough hypotheses, or the definition depends on cases

**Section 3.4 Activity 1 [75-90]**

* Try a proof by cases of if n is an integer then….

Part 5: Quiz (90-110 minutes)

* Skills L2, L3, L4, L5

Preview Activity for next time: Division algorithm and questions for the midterm (separate)

Synthesis activity for next time: Section 3.3 #2(b) [note there’s a solution in the back, but you should try it on your own first, making a note of where you get stuck if you get stuck], Section 3.3 #20(a) and (c). Note both are incorrect proofs, what I would like you to do is explain the error.