Intro to Proofs Day 3 Outline (This class meets for 1 hour and 50 minutes.)

**Need notecards with logical equivalencies, extra markers, quiz 1 (green), Section 2.3 worksheet, hand back graded synthesis activities**

**Synthesis Presentation**[0-20 minutes]

* **Section 1.2 Exercise 4(b) on page 27:** If m is an odd integer then 5m+7 is an odd integer.
  + **Questions/comments:** How did you know to use 5m+7=5(2n+1)+7? How do you justify each step? What’s a formal proof?
* **Section 1.2 Exercise 10(b) on page 28:** If and b are both type 2 integers then a+b is a type 1 integer.
  + **Questions/comments:** Tricky part is realizing 4 can be split into 3+1. What are type 0,1,2 integers compared to even and odd?
* **Talk about direct proofs:** The only time a conditional statement is going to be false is when the hypothesis is true and the conclusion is false. So let’s say the hypothesis is true and try to show that there’s no way the conclusion is false.

**Writing guidelines** [20-35 minutes]

* Discuss surprising/questions they had from PA on writing guidelines.
* They do page 3 of 1.2 worksheet (and page 2 of the 2.1 worksheet)

**Truth Tables** [35-60 minutes]

* Go over PA: Slide 3 of P*or*(Q *and* R) if necessary
* Go over converses and contrapositives watch this video right before class The converse and contrapositive of a conditional statement.
* Go over PA: Slide 4. Talk about converse and contrapositive of “If you are happy and you know it clap your hands.
* Show a conditional statement and its contrapositive are logically equivalent (using truth table). This means we have two “proof techniques”
  + Direct: Assume P and show Q has to be true (because the only way the statement would be false is if P were true and Q were false)
  + Contrapositive: Assume not Q and show not P, because this is a direct proof of a logically equivalent statement
* Do page 3, top half.
* Groups of 3 to do 6 important logical equivalences on board. When done do part 2 of page 3 on 2.1-2.2

BREAK [60-70 minutes]

**Negations** [70-85 minutes]

* Note that some of these allow us to negate things. List the three important ones (negate and, or, “if-then”)
* Negate “If you are happy and you know it, clap your hands”.
* They work on page 4 of 2.1-2.2 worksheet

**Sets** [85-100 minutes]

* Go over PA
* Progress Check 2.9 on a slide
* Page 1 of 2.3 worksheet

**Quiz** [100-110]

* Skill L1

**Synthesis Activity:**

* Section 2.2, Exercise 9(d) [on page 50]: Do using a truth table AND using previously proven logical equivalences
* Section 2.2, Exercise 11(a)-(d) [on page 51]

**Preview Activity:**

* Download LaTeX
* Set builder notation
* For all and there exists