Intro to Proofs Day 11 Outline (This class meets for 110 minutes.)

**Exam copies, cards,**

PART 1: Synthesis Stuff (0-25 minutes)

**A Proof by Contradiciton**

* For all integers a and b, if a is even and b is odd then 4 does not divide a^2+b^2
* Solution on back of 3.3 worksheet

**Section 3.3 #20a**

* Proof on a slide
* Just because two things are not equal before a calculation, doesn’t mean they are not equal after!

**Section 3.3 #20c**

* The negation says that “THERE EXISTS” a real number such that…. Showing there is one real number where it does not work does not contradict that there exists such a real number.

PART 2: Proof by Cases (25-50)

**Discuss part of Preview Activity [ 25-30 minutes]**

* Slide 4: What’s P, Q, and R
* Slide 5: Proved that for every integer *n* the integer 3n^2+n+14 is even
  + 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 – Page 1 [30-35 minutes]**

* Fill in what we’ll do, why it works, why it matters
* Common cases is for them to fill in as we go.

**Section 3.4 Theorem 1 [35-50]**

* Try a proof by cases of if n is an integer then n^2+n+8 is even (very similar to the proof in the video)
* Have someone present

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

Part 2 Continued: More Proof by Cases (60-110)

**Discuss more of Preview Activity [60-65 minutes]**

* Show the Maryam answer discussing absolute value. Have them do |7| and |-4}

**Section 3.4 Theorem 2 [65-85 minutes]**

* Discuss as a class how to set up. Example: |x|<a if and only if -a<x<a. Suppose |x|<a. We will use two cases: if x>= 0 or if x<0.
* How many cases do you think there will be now that there’s two variables?
* Divide up cases – they work on their case, have a group member write on the board, then work on other cases

**Section 3.4 Theorem 3 [85-100 minutes]**

* Together: Do you believe this statement is true? Test by choosing an n and an a (or several)
* They prove Theorem 3 – Help them set up. If a is not congruent to 0 (mod 5) how could we split that into cases.

Part 3: Exam Review [100-110]

* Problem #2 of the practice exam – go over
* Section 3.2 – more methods of proof. Expected to write a proof of a biconditional, or do a proof by contrapositive.
* Section 3.3 – Expected to be able to describe how to start a proof by contradiction, describe what a contradiction is

\*\*\*PASS OUT EXAM\*\*\*\*

No synthesis for Monday. Preview Activity on the division algorithm.