Groupwork on Types of Proof

MATH 135: First Steps into Advanced Mathematics   February 11, 2020

You read about two more types of proof for class today. Let's see how we can use them!

Consider the statement: If 7x-13 is even, then x is odd.

   (Note that your answers in (a)-(c) should be specifically in relation to this theorem not in relation to statements in general. In other words, if you want to say "assume the hypothesis is true" you actually should tell me what the hypothesis is. So you should say "assume BLAH" where BLAH comes directly from the statement above.)
   This is the process you should think about before you prove any statement when you are trying to decide what method to use! In particular, if you feel stuck, follow through this thought process and ask yourself these questions!

   (a) State your assumptions and final conclusion if proving this statement by direct proof.

   (b) State your assumptions and final conclusion if proving this statement by proof by contraposition.

   (c) State your assumptions and final conclusion if proving this statement by proof by contradiction.

   (d) Write any definitions you need to prove the statement. That is, write the definitions of any terms used in parts (a)-(c).

(e) Do at least two examples that illustrate the concepts in the statement. In particular, produce one x which fulfills the hypothesis of the statement and one that does not. Be sure to explain what your examples are showing.

(f) Write a **rough** draft/outline of a proof where you prove the statement by contraposition.

(g) Write a final draft of the proof you worked on in part (f). It should be beautiful with nothing crossed out, etc.

(h) Would either of the other two techniques be useful? Why or why not?

(i) What are the advantages and disadvantages of using proof by contradiction in general (not specifically for this theorem)?