

Math 331 Worksheet 4

Note: None of these problems are for a grade, though you may obtain extra credit for writing up proofs on the board.

1) Greenberg notes on page 106, “The flaw in the argument from diagrams in Chapter 1 that all triangle are isosceles has to do with betweenness.” Go back to this argument and see whether you can pinpoint what he is referring to.

2) Go over the proof of the “line separation property” on page 113 and make sure everyone in your group understands it. Now draw a picture that helps to illustrate what the property gives you. Do you now think that the line separation property is maddeningly obvious? Why or why not?

3) Prove the following propositions from the book.

a) (Proposition 3.5) Given $A * B * C$. Then $AC = AB \cup BC$ and B is the only point common to segments AB and BC .

b) (Proposition 3.6) Given $A * B * C$. Then B is the only point common to rays \overrightarrow{BA} and \overrightarrow{BC} , and $\overrightarrow{AB} = \overrightarrow{AC}$.

4) It is noted that we pay a price for assuming Betweenness Axiom 3: no more projective planes! However, projective geometry is just too useful to do away with entirely. Take a look at Appendix A to see what stands in for “betweenness” in projective planes. Can you use these “separation axioms” to establish Betweenness Axiom 3 on the ‘affine’ part of the projective plane? Why or why not ?