

Name: \_\_\_\_\_

Math 331 Foundations of Geometry – Crawford

Quiz 1

16 September 2015

Books, calculators, and notes (in any form) are not allowed. Show all your work for credit. **Good luck!**

INCIDENCE GEOMETRY AXIOMS

- **Incidence Axiom 1.** For every pair of distinct points  $P$  and  $Q$  there exists exactly one line  $l$  such that both  $P$  and  $Q$  lie on  $l$ .
- **Incidence Axiom 2.** For every line  $l$  there exist at least two distinct points  $P$  and  $Q$  such that both  $P$  and  $Q$  lie on  $l$ .
- **Incidence Axiom 3.** There exist three points that do not all lie on any one line.

PARALLEL POSTULATES

- **Euclidean Parallel Postulate.** For every line  $l$  and for every point  $P$  that does not lie on  $l$ , there is exactly one line  $m$  such that  $P$  lies on  $m$  and  $m \parallel l$ .
- **Elliptic Parallel Postulate.** For every line  $l$  and for every point  $P$  that does not lie on  $l$ , there no line  $m$  such that  $P$  lies on  $m$  and  $m \parallel l$ .
- **Hyperbolic Parallel Postulate.** For every line  $l$  and for every point  $P$  that does not lie on  $l$ , there are at least two lines  $m$  and  $n$  such that  $P$  lies on both  $m$  and  $n$  and both  $m$  and  $n$  are parallel to  $l$ .

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1. (8 pts) Given the following model,

Points:  $\{A, B, C, D\}$

Lines:  $\{A\}, \{A, B, C, D\}$

(a). Sketch a schematic diagram of this model.

(b). Determine which of the Incidence Axioms hold and which of the Parallel Postulates Hold.

IA1            yes    no

IA2            yes    no

IA3            yes    no

Euc PP        yes    no

Ell PP        yes    no

Hyp PP        yes    no

2. (6 pts)

(a). Write the contrapositive of the following statement: If  $ABC$  is a triangle, then the angle sum is  $180^\circ$ .

(b). Negate the following statement: If it is Dom Toretto, then he is fast and furious.

3. (6 pts) Given the two statements  $\underline{P \Rightarrow Q}$  and  $\underline{\text{not } P \text{ or } Q}$  (i.e.  $\sim P \vee Q$ )

(a). Construct truth table(s) for these statements.

(b). Are the statements logically equivalent?