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Homework H05
MATH 3110/5110
Due Mon, Feb 21, 2022

Problem:	1	2	3	4	5	6	7	8	Total	Rescaled
Your Score:										
Possible:	20	20	20	20	20	20	20	20	160	10

This Homework is worth extra points because it contains eight problems instead of the usual five.

Suggested Exercises: 3.3#2,3,4,9,11,12,13,14,15 and 3.4#1,2,3,4
Assigned Exercises:

[1] Write the negation of each of these statements

(a) If the dog is blue then the bear is hungry.

(b) For all vehicles, if the vehicle is a pickup truck then the vehicle is a Ford.

[2] (3.3#4) **Prove** that "congruence" is an equivalence relation on the set of line segments in a metric geometry.

[3] (3.3#5) **Prove** Theorem 3.3.8 (Segment Addition)

[4] (3.3#11) (b) Let $P = (0,2)$ and $Q = (0,8)$ in $\mathbb{R}^2$.

(a) Find the *Euclidean midpoint* M of *Euclidean segment* $\overline{PQ}$. (Use *Euclidean* distance.)

(b) Find the *Poincaré midpoint* N of *Poincaré segment* $\overline{PQ}$. (Use *Poincaré* distance.)

(c) Make a large, neat drawing showing $\overline{PQ}$ with points P, Q, M, N labeled with (x, y) coordinates.

[5] Let $A = (6,5)$, $B = (10,3)$, $P = (0,2)$, and $Q = (0,8)$ in the *Poincaré plane*.

(a) Theorem 3.3.6 (Segment Construction) says that there is a unique point $C \in \overrightarrow{AB}$ such that $\overline{PQ} \simeq \overline{AC}$. Find it.

(b) Make a drawing showing your results. Make your drawing large and neat, and label important stuff: points A, B, C, P, Q the ray $\overrightarrow{AB}$ and segment $\overline{PQ}$, as well as the dotted remainders of lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{PQ}$ along with their missing endpoints and centers. Label the lines with their descriptions.

[6] (Exercise #11(a)) **Prove:** Given distinct points A, B in a metric geometry, the segment $\overline{AB}$ has a midpoint M.

[7] Here are four symbols: (i) $\overline{AB} \simeq \overline{CD}$ (ii) $\overline{AB} = \overline{CD}$ (iii) $AB \simeq CD$ (iv) $AB = CD$
Three of them are valid symbols. Explain what they mean. One of them is not a valid symbol. Which one?

[8] Let $A = (2,5), B = (6,5), C = (2,3)$.

(a) Draw *Euclidean triangle* ΔABC. Make your drawing large and clear and label stuff.

(b) Draw *Poincaré triangle* ΔABC. Make your drawing large and clear, and label important stuff. In particular, give the decription of all *Poincaré lines* that the line segments lie in.