

Geometry Homework Week 3

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1 Problems

1. (Problem 1.40, Canada 1991/3) Let P be a point inside circle ω . Consider the set of chords of ω that contain P . Prove that their midpoints all lie on a circle.
2. (Problem 1.39, CGMO 2012/5) The incircle of $\triangle ABC$ is tangent to \overline{AB} and \overline{AC} at D and E , respectively. Let O denote the circumcenter of $\triangle BCI$. Prove that $\angle ODB = \angle OEC$.
3. Let A, B, X, Y be points on a circle in some order and let $P = \overline{AB} \cap \overline{XY}$. Prove that $\triangle PAX \sim \triangle PYB$, and conclude that $PA \cdot PB = PX \cdot PY$. (Note: P could be inside the circle or outside! Make sure to handle both cases.)