Extra credit problems

Math 471

0. Find a mistake or misprint in the book. (The score depends on the type of mistake.)

1. Show that a composition of three reflections in the sides of a nondegenerate triangle does not have a fixed point.

2. Given disticnt points A, B and X make a ruller-and-compass construction of another point $Y \in (AX)$ such that $AY + BY = AX + BX$ and explain why it works. (You may play with the GeoGebra applet apfzzybw.)

3. Let m be an indirect motion of the plane. Show that the midpoints of all line segments $[X\, m(X)]$ lie on one line.

4. Let us denote by ρ_ℓ the reflection across line ℓ. Let ℓ and m be lines on the plane and n is the reflection of ℓ across m. Show that $\rho_m \circ \rho_\ell = \rho_n \circ \rho_m$.

5. Lines ℓ and m are tangent to two circles of radiuses r and R on such a way the circles are on one side of ℓ and on different sides of m. Let A and B be tangential points of ℓ and Q be the point of intersection ℓ and m. Show that $QA \cdot QB = R \cdot r$.

6. Given a line segment with marked midpoint, perform a ruler-only construction a line through a given point parallel to the the segment. Explain why it works. (You may play with the GeoGebra applet qrnffpkv.)