## HOMEWORK 4 - MATH 325

## DUE DATE: Tuesday, March 11

**INSTRUCTOR:** George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 5 points. It is necessary to show your work. GOOD LUCK!!

- 1. Two circles are in contact internally at a point T. Let the chord AB of the larger circle be tangent to the smaller circle at a point P. Then the line TP bisects  $A\hat{T}B$ .
- 2. The points where the extended altitudes meet the circumcircle form a triangle similar to the orthic triangle.
- 3. (a) What point on the circle has CA as its Simson line?
  - (b) Are there any points that lie on their own Simson lines? What lines are these?
- 4. The tangents at two points B and C on a circle meet at A. Let  $A_1B_1C_1$  be the pedal triangle of the isosceles triangle ABC for an arbitrary point P on the circle, as in Figure 2.5B, page 41. Then  $PA_1^2 = PB_1 \times PC_1$ .
- 5. If a point P lies on the arc CD of the circumcircle of a square ABCD, then PA(PA + PC) = PB(PB + PD).
- 6. If a circle cuts two sides and a diagonal of a parallelogram ABCD at points P, R, Q as shown in Figure 2.6A, page 43, then  $AP \times AB + AR \times AD = AQ \times AC$ . (*Hint*: Apply Theorem 2.61 to the quadrilateral PQRA and then replace the sides of PQR by the corresponding sides of the similar triangle CBA.)