FINAL EXAM - MATH 325

Friday, May 2, 2003 INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 10 points. It is necessary to show your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

- 1. (a) State Ceva's Theorem.
 - (b) Give a proof of Ceva's Theorem.
- 2. (a) Give the definition of the Euler line.
 - (b) Prove the Theorem of Gergonne: The lines joining the vertices of a triangle with the points where the incircle touches the opposite sides are concurrent.
- 3. (a) Define the 9 point circle.
 - (b) Prove that the three feet of the altitudes of a triangle and one of the midpoint of one of its sides are cocyclic.
- 4. (a) Define the power of a point with respect to a circle.
 - (b) Show that the power of a given point lying outside a given circle with respect to that circle is equal to the square of the length of one of the tangents from the point to the circle.
- 5. (a) State Simson's Theorem.
 - (b) Give a proof of Simson's Theorem.
- 6. (a) State Pierre Varignon's Theorem.
 - (b) Give a proof of Varignon's Theorem.
- 7. (a) State Menelaus's Theorem.
 - (b) Give a proof of Menelaus's Theorem.
- 8. (a) State Pappus's Theorem.
 - (b) If A, C, E are three points on one line, B, D, F on another, and if the two lines AB and CD are parallel to DE and FA, respectively, then EF is parallel to BC.
- 9. (a) State Desargues's Theorem.
 - (b) State Pascal's Theorem.
- 10. (a) State Brianchon's Theorem.
 - (b) Give the formulas of Brahmagupta and of Heron for the area of a cyclic quadrangle and of a triangle respectively.