Math 45021 Homework 4

Due March 24th

1. In Geogebra, construct the following for the same triangle $\triangle ABC$. (Remember you can hide/show parts of the drawing easily by either right clicking or clicking the circle beside the object's name on the left of the screen.)

   a) The midpoints of all sides M_a, M_b, M_c.

   b) The centroid G.

   d) The circumcenter O, and circumcircle, with circumradius R.

   e) The altitudes of each side, the points where they hit the extended sides F_a, F_b, F_c, the orthocenter H, and the midpoints of $\overline{AH}, \overline{BH}, \overline{CH}$ denoted H_a, H_b, H_c.

   f) The midpoint of $\overline{OH}$ denoted N. The circle center N and radius NM_a.

   What is the relationship between OC and NM_b? What special points are colinear? Draw this line segment. What nine points lie on the circle created with center N? Describe what happens when the triangle is equilateral, isosceles, right, and obtuse. (Remember to hide (not delete) the lines used to construct the points of interest so that the drawing does not become too cluttered.)

2. In Geogebra, construct the following for a new triangle $\triangle ABC$.

   a) The excircles with excenters I_a, I_b, I_c, with exradii r_a, r_b, r_c.

   b) The incircle with incenter I and inradius r

   What happens when you drag C around A counterclockwise? Confirm the formula $K^2 = rr_ar_br_c$.

3. pg. 105: 7.1, 7.2, 7.3, 7.5, 7.9(a)

4. pg. 114: 8.2, 8.8, 8.11

5. pg. 126: 9.1, 9.3