MA 330 ASSIGNMENT # 3

Answers to problems may be handwritten.

(1) Airplanes that fly across the ocean usually do not follow latitude lines. Why not?
(2) The state of Wyoming's borders are the longitude lines 104°3′W and 111°3′W, and the latitude lines 41°N and 45°N. In spherical geometry, the sum of the angles of a quadrilateral are always greater than 360°, but each corner of Wyoming is a right angle! How is this possible? (Hint: this is related to the previous problem.)
(3) The following exercises demonstrate that, in a non-Euclidean geometry where the sum of the angles of a triangle is less than 180°, any two triangles with the same angles are congruent. Notice how this is not the case in Euclidean geometry!
   (a) Suppose that triangles ABC and DEF are similar, and suppose that $\overline{AB} < \overline{DE}$. Choose a point G on DE such that $\overline{DG} = \overline{AB}$, and choose a point H on DF such that $\angle DGH = \angle ABC$. Draw a picture of this situation.
   (b) Show that $\angle EGH = 180° - \angle DGH$ and $\angle FHG = 180° - \angle DHG$.
   (c) Conclude that the sum of the angles of quadrilateral EFHG is 360°. Why is this a contradiction?