

## MA 330 ASSIGNMENT # 7

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  $104^{\circ}3'W$  and  $111^{\circ}3'W$ , and the latitude lines  $41^{\circ}N$  and  $45^{\circ}N$ . In spherical geometry, the sum of the angles of a quadrilateral are always greater than  $360^{\circ}$ , 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  $180^{\circ}$ , 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  $EF$  such that  $\angle DGH = \angle ABC$ . Draw a picture of this situation.
  - (b) Show that  $\angle EGH = 180^{\circ} - \angle DGH$  and  $\angle FHG = 180^{\circ} - \angle DHG$ .
  - (c) Conclude that the sum of the angles of quadrilateral  $EFHG$  is  $360^{\circ}$ . Why is this a contradiction?