H. Geom. Non Euclidean Surfaces Review

1. Give counterexamples for each of the statements below. Site as many specific cases as possible.

*a) A straight angle always measures 180°.*

*b) Two points always determine a unique line.*

*c) All lines on a given surface look the same extrinsically.*

2. An astronomer measures the angles of a triangle in space and finds the sum of the angles is 170°. What can she conclude?

3. Do any of the following theorems fail on a non-euclidean surface? If so, describe how and/or make a sketch.

*a) Vertical angles are congruent.*

*b) A line may never intersect itself.*

*c) There is exactly one point midway between two given points.*

*d) A line may always be translated indefinitely along its length.*

4. Which of the properties of a square remain true on any surface:

a) 90° angles b) parallel opposite sides

c) finite perimeter d) symmetry