Topic 3 Homework

1. Name the geometry in which each of the statements is possible.
   a) The sum of the measures of the angles of a triangle is 180°.
   b) The sum of the measures of the angles of a triangle is greater than 180°.
   c) The summit angles of a Saccheri quadrilateral are right angles.
   d) No line can be drawn through a point parallel to a given line.
   e) Lines have finite length.
   f) The summit angles of a Saccheri quadrilateral are acute.
   g) The measures of the summit angles of a Saccheri quadrilateral are greater than 90°.
   h) Given a point not on a line, there are an infinite number of lines through the point that do not intersect the given line.

2. Multiple Choice. Which one of the following is a Saccheri quadrilateral?

   A   B   C   D

3. In Elliptic geometry, “lines” are called _____ _____.

4. In Euclidean geometry, we know that two lines are either parallel or intersect at exactly one point. In Elliptic geometry, lines intersect in how many points?

5. The lines \(n\) and \(m\) on the sphere at right appear to be parallel. Yet, we said in class that there are no parallels in Elliptic geometry. What’s wrong with our reasoning?

6. In Euclidean geometry, we say that a line has no endpoints. Does this apply to lines on a sphere?

7. What is the name of the figure shown at right?
   What type of geometry does it model?

8. What book is second only to the Bible in the number of editions published and who is its author?
Answers:

<table>
<thead>
<tr>
<th></th>
<th>1a) Euclidean</th>
<th>1b) elliptic</th>
<th>1c) Euclidean</th>
<th>1d) elliptic</th>
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</thead>
<tbody>
<tr>
<td>1e) elliptic</td>
<td>1f) hyperbolic</td>
<td>1g) elliptic</td>
<td>1h) hyperbolic</td>
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</tbody>
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2. A

3. great circles.

4. 2

5. Lines are great circles and $n$ is not a great circle.

6. Yes

7. Pseudosphere; hyperbolic

8. Elements; Euclid