

MAT 310, Fall 2003, Zandieh

Quiz 1

50 points

Do not write your answers on this page. Use the blank paper that is provided.

However, do put your name on this page and staple it to the top of your work when you are done.

1. (3 points) Describe one way to physically construct a straight line that will work on both the plane and the sphere.
(3 points) Name three other properties that straight lines in the plane and straight lines on a sphere have in common.
(2 points) List two ways in which straight lines in the plane and straight lines on a sphere are different from each other.
(2 points) Explain why a line segment on a sphere might not denote the shortest distance between its two endpoints.
2. (10 points) List the symmetries of a non-square rectangle on the plane; include any intrinsic rotation, reflection, rigid-motion or central symmetries. Make sure to state the exact location of any relevant points or lines and specify any relevant amounts.
3. (10 points) Describe rigid-motion-along-itself symmetry for a straight line in a way that works for both the plane and the sphere. As part of your explanation, describe in some detail what happens to a point on the line and what happens to a point not on the line. Especially be very specific when describing what happens to a point not on the line on a sphere. Are there any points that do not move under this transformation on the plane? On the sphere?
4. (6 point) Explain the central (or point) symmetry transformation. As part of your explanation, describe in some detail what happens to a point on the line and what happens to a point not on the line.
(4 point) Explain why this transformation has the same result as the half-turn transformation on the surface of the plane or sphere.
5. (3 points) Explain in detail how the dilation transformation works on the plane by using the example of dilating a non-square rectangle by a factor of 2 from a point on the rectangle of your choosing.
(4 points) Explain why dilation (from a point on the figure) is not a symmetry of this rectangle but is a symmetry of an infinite line.
(3 points) Explain why dilation (from a point on the figure) is not a symmetry of a great circle.