MATH 406 Geometric Structures

Study Guide for Test #3 (Wednesday, May 4) Bring a scientific calculator to the test session.

4.1.1 Given the coordinates of three vertices of a triangle, show how to use Theorem 4.1.1 to determine the area of the triangle.

4.1.2 Given the coordinates of two points, show how to use Theorem 4.1.2 to find the equation of the line determined by the two points.

4.2.1 Define each of the following:
a. one-to-one mapping from A to B b. linear transformation from E^2 to E^2 c. isometry

4.2.2 Given a verbal description of a transformation from E^2 to E^2, determine the matrix representation for the transformation.

4.2.3 Given the matrix representation for a transformation from E^2 to E^2 determine:
a. the image of the unit square under the transformation.
b. the matrix representation for the inverse of the given transformation
c. the image of a specified line under the transformation.

4.2.3 Given a verbal description of a transformation from E^2 to E^2 determine:
a. the image of a specified triangle under the transformation.
b. the image of a specified line under the transformation.
c. a verbal description of the inverse of the given transformation.

4.3.1 Prove: Theorem 4.3.9 & Theorem 4.3.10

4.4.1 Given a sequence of isometries (translations, rotations, reflections), explain how the sequence of transformations can be composed into a single transformation.

4.4.2 Prove: Theorem 4.4.4 & Theorem 4.4.5

4.5.1 Show how to use composition of transformations to determine matrix representations for rotations about arbitrary centers and reflections about arbitrary lines. (Theorems 4.5.1, 4.5.2)

4.5.2 Given an object set and an image set, determine the matrix representation for the transformation that maps the object set onto the image set. (Example 4.5.2)

4.5.3 Given a transformation, find all invariant points and all invariant lines under the transformation.

4.6.1 Define: dilation

4.6.2 Prove: Theorem 4.6.1, Theorem 4.6.2, Theorem 4.6.3, & Theorem 4.6.4

4.6.3 Given a dilation, strain, shear, or general affinity, find all its invariant points and lines if any exist.