Name: _____

Math 110 – Exam 3

5 March 2004

Directions: There are nine questions on this exam. Answer every question. Show all work and justify your answers. Each question is worth five points.

1. (a) Austin has drawn a right triangle. The lengths of the legs are 5 and 12. Use the Pythagorean Theorem to calculate the length of the hypotenuse.

   (b) Jackson has drawn a triangle whose sides have lengths 5.6, 7.1, and 9.8. Use the Pythagorean Theorem to determine whether or not this is a right triangle.

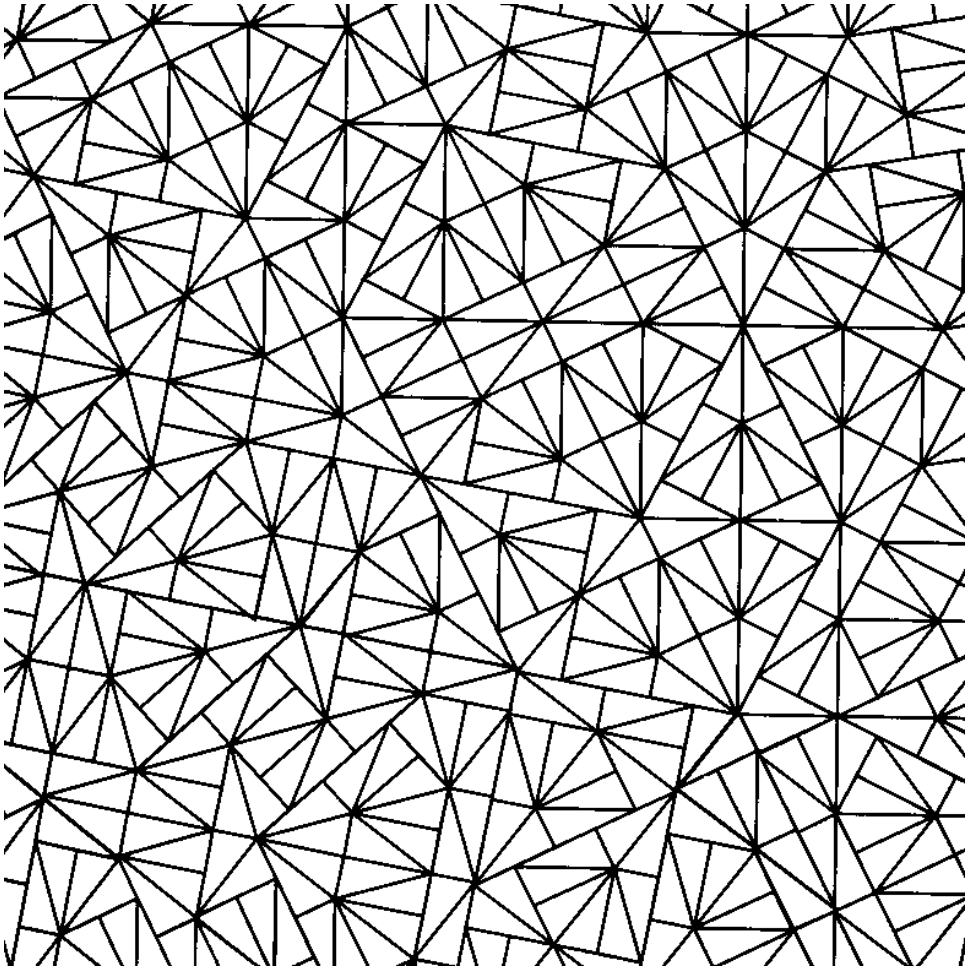
2. (a) Give a precise statement of the Art Gallery Theorem.

   (b) Explain what it means in your own words.

3. In the following piece of the Pinwheel Pattern:

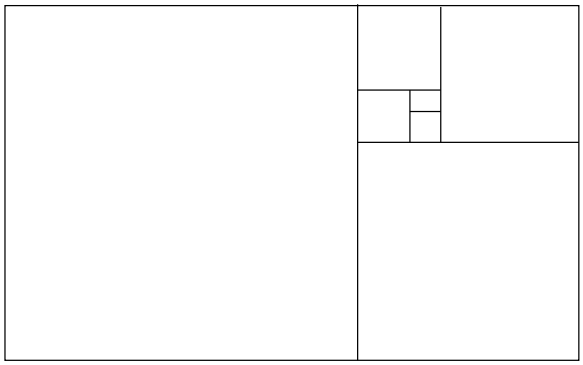
   (a) Outline a 5-unit supertile.

   (b) Outline a 25-unit super-supertile



4. (a) Draw the Golden Spiral in the Golden Rectangle.

   (b) Find (and clearly mark) the center point from which the spiral spins.

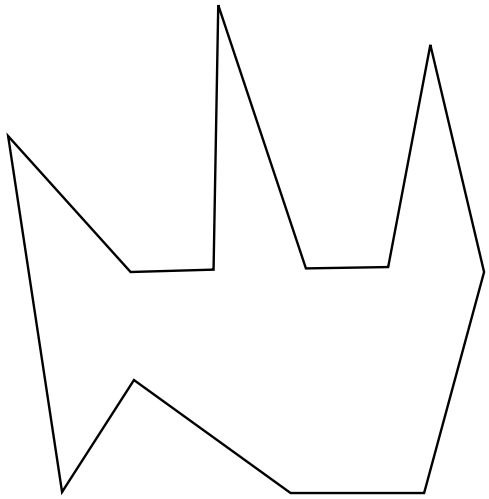


5. For the following gallery:

   (a) Triangulate the museum by adding straight lines which do not cross each other yet span the insides and extend from one vertex to another (like we did in class and in the homework).

   (b) Color each vertex of the gallery so that each triangle has one red, one yellow, and one blue vertex. You can use symbols to stand for the colors.

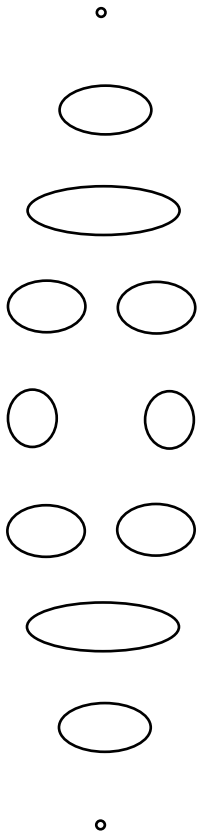
   (c) At which vertices would you place the cameras?



6. (a) Sketch cubes in 2, 3, and 4 dimensions.

   (b) How many vertices (corners) are there on a 4-dimensional cube?

7. A two-dimensional being sees the following series of nine images. What three-dimensional shape passed through the two-dimensional world?



8. (a) Define *rigid symmetry*.

(b) Explain (in your own words) what it means when we say: The Pinwheel Pattern has a symmetry of scale, but it has no rigid symmetries.

9. The height (short side) of a Golden Rectangle is two. Find the area of the rectangle.

[Bonus: 3 points] Consider the following rectangle which occurs in the Pinwheel Pattern. Is it a Golden Rectangle (justify your answer)?