MATH 122　　　Calculus and Analytic Geometry II　　　Fall 2005　　　Project #3

**Instructions**

　　You should submit a carefully written report addressing the problems given below. You are encouraged to discuss ideas with others for this project. If you do work with others, you must still write your report independently.

　　Use the writing conventions given in *Some notes on writing in mathematics.* You should include enough detail so that a reader can follow your reasoning and reconstruct your work. You should not show every algebraic or arithmetic step. All graphs should be done carefully on graph paper or using appropriate technology.

　　The project is due in class on Monday, November 21.

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　　The *Koch snowflake sequence* is defined in the following way: Start with an equilateral triangle having sides of length $l$. Produce a new polygon by replacing the middle third of each side with an equilateral triangle having sides of length $l/3$ and then remove the base of each new triangle. Repeat the process of replacing the middle third of each side with an equilateral triangle and removing the base. The plots below show the 0, 1, 2, and 5 elements in the snowflake sequence. The *Koch snowflake* is the limit of this sequence of polygons.

1. Find the sequence of the perimeters of the Koch snowflake sequence. Determine whether the sequence of perimeters converges or diverges. If it converges, find the limit.

2. Find the sequence of the areas of the Koch snowflake sequence. Determine whether the sequence of areas converges or diverges. If it converges, find the sum.

3. Write a sentence or two summarizing your results in geometric terms.