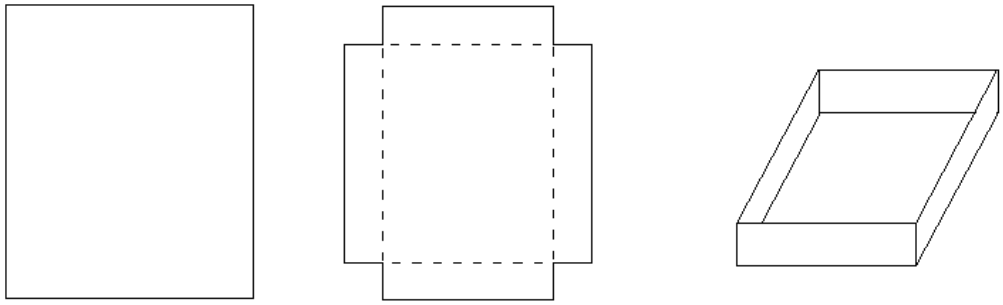
Calculus Challenge Problem #5 Due, Wed., Dec. 3

A New Look at an Old Problem

By now, you will likely have considered "the box problem". In this problem, you begin with a rectangular piece of paper, cut out squares in the corner, and make a box with the largest possible volume.

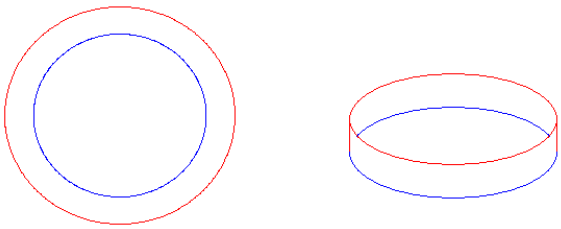


1) Find the dimensions of the largest box that can be made from a sheet of paper that is 10 inches wide and 16 inches long.

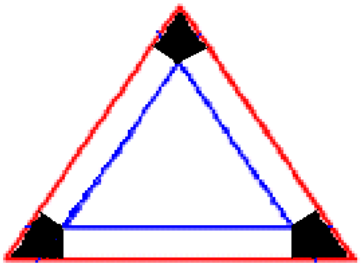
a) For this box, compare the area of the base to the area of the sides of this box.

b) Can you find another rectangle that has this same relationship between the area of the base and the area of the sides for the largest volume? Is the relationship you see a general one for all boxes made from rectangles or is there something special about an 10 x 16 inch sheet of paper that produces this result?

2) Suppose we use a round piece of paper to make a circular "box" by folding up the sides. Of course, the sides will crinkle up, but imagine we can cut out the excess and throw it away. What is the relationship between the area of the base and the area of the side of this "box".



3) Try this with an equilateral triangle. Cut out kites in the corners and fold up the sides to make the box of maximum volume. How does the area of the sides compare to the area of the base? Show your work.



(A special thanks to Scott Farrand, Professor of Mathematics at the California State University at Sacramento for this problem.)