MATH 115 **Name:** ____________________

In class work 8, Fall 2022 **Row and Seat**:____________________

In class work 8 has questions 1 through 2 with a total of 5 points. Turn in your work at the end of class *on paper*. This assignment is due *Wednesday 9 November 13:15* PM.

$\boxed{5}$ 1. Show that among all rectangles with a given perimeter, a square has the greatest area.

To do this, let the lengths of the two perpendicular sides of the rectangle be x and y and let L be the perimeter of the rectangle. That makes $L = 2x + 2y$ a constraint. The other constraints are $0 \le x$ and $0 \le y$. We have $A = xy$. Your task is to maximize A subject to the constraints $L = 2x + 2y, 0 \le x$, and $0 \le y$ with L given.

2. Show that among all isosceles triangles with a given perimeter, the equilateral triangle has the greatest area.

   To do this, let the lengths of the sides of the triangle be x, x, and y and let L be the perimeter. That makes $L = 2x + y$ a constraint. The other constraints are $0 \le x$ and $0 \le y$. The area A of the triangle is (this is a specialization of the wonderful formula for the area of a triangle that is due to Hero of Alexandria 10 AD – c. 70 AD)

   $$A = (x + y)\sqrt{2y(x + 2y)}$$

   Solve the constraint $L = 2x + y$ for y and paste that result in the formula for A. Now do some calculus. If the algebra seems daunting to you, set $L = 3$ and work that specialization.