1. What is the maximum volume for a rectangular box made from 12 square feet of cardboard?

2. A farmer has 2400 ft of fencing and wants to fence off a rectangular field that borders a straight river. He needs no fencing along the river. What are the largest dimensions of the field that has the largest area?

3. Find the dimensions of the rectangle of perimeter 24 that has the largest area.

4. Find the points on the parabola $y^2 = 2x$ that are closest to the point $(1, 4)$.

5. Find the points on the ellipse $4x^2 + y^2 = 4$ that are farthest away from the point $(1, 0)$.

6. Find the points on the hyperbola $xy = 8$ that are closest to the point $(3, 0)$.

7. Find the area of the largest rectangle that can be inscribed in a semicircle of radius $r$.

8. A window in the shape of a rectangle capped by a semicircle is to have perimeter $p$. Choose the radius of the semicircular part so that the window admits the greatest amount of light.

9. A rectangular warehouse will have 5000 square feet of floor space and will be separated into two rectangular rooms by an interior wall. The cost of the exterior walls is 150 per linear foot and the cost of the interior wall is 100 per linear foot. Find the dimensions that will minimize the cost of building the warehouse.

10. From a rectangular piece of cardboard of dimensions $8 \times 15$, four congruent squares are to be cut out, one at each corner. The remaining crosslike piece is then to be folded into an open box. What size squares should be cut out if the volume of the resulting box is to be a maximum?

11. A triangle is formed by the coordinate axes and a line through the point $(2, 5)$ as in the figure. Determine the slope of this line if the area of the triangle is to be a minimum.