1. Find an equation of the line through the point (3, 5) that cuts off the least area from the first quadrant.

2. The manager of a 100-unit apartment complex knows from experience that all units will be occupied if the rent is $800 per month. A market survey suggests that, on average, one additional unit will remain vacant for each $10 increase in rent. What rent should the manager charge to maximize revenue?

3. You have a piece of cardboard that is 10 by 20 and you want to make an open topped box by cutting squares out of the corners and folding up the sides.
   (a) Sketch this situation.
   (b) Why do you have to cut out squares?
   (c) Find the largest box by volume that you can build.

4. A boat leaves the dock at 4 pm in the southern direction with 40 km/h. Another boat which was coming from the eastern direction with 30 km/h reaches the dock at 5 pm. When were the two boats the closest to each other?

5. What is the largest rectangle that can be inscribed in the ellipse $\frac{x^2}{4} + \frac{y^2}{25} = 1$?

6. What is the largest area of a norman window (picture below) if the perimeter is equal to 30?

7. You have gone hiking and your car is 5 miles east and 4 miles north of where you are. You are standing in a forest that stretches 3 miles north of you where it borders a field, and the boundary of the field and the forest runs east-west.
   (a) Sketch the forest and field, with your location and the location of your car.
   (b) If you can hike through the forest at 2 miles per hour and through the field at three miles per hour, generate a function which tells you how long it takes you to reach your car if your path consists of two straight lines, one through the woods and one across the field (it will probably help if you sketch an example).
   (c) Find the fastest path to your car.
   (d) Is the shortest path between two points always a straight line?