1 Optimization

1. Suppose you are trying to make a rectangular fence for your yard. You only have $100m$ of fence but luckily your house borders a straight river, so one side of your rectangular yard will be bordered by a river. What is the largest area yard you can enclose?

2. You want to construct a cylindrical container that contains $100\pi m^3$ of water. What should the dimensions of the container be if you want to minimize the total surface area?

3. An airline is selling tickets for $200 each and sells 50 per plane. For every $10 they decrease the price, they sell 10 more tickets. The plane can hold a maximum of 100 passengers. At what price should they sell their tickets for maximum revenue?

4. Find the rectangle of largest area whose diagonal is of length L.

5. Find the area of the smallest triangle formed by the x axis, y axis, and a line that goes through the point $(4, 2)$.

6. Find the largest rectangle that can be inscribed into a semicircle of radius 1 so that one side of the rectangle is part of the diameter of the semicircle.

7. Suppose you only have $1m$ of wire. You are to construct a circle and a square. What is the maximum and minimum total area of the circle and square?