Calculus I
Practice Problems 7

1. Find the dimensions of the right triangle with one vertex at the origin, the right angle on the positive x-axis, and the third vertex on the curve $y = 4 + x^{-2}$ which is of minimum area.

2. We are asked to make an open-topped box out of a rectangular sheet of tin 24 in. wide and 45. in long. This is to be done by cutting congruent squares out of each corner of the sheet and then bending sides upward to from the sides of the box. What are the dimensions of the box of greatest volume?

3. An object is moving on the plane. It starts at one foot up the y-axis (at $(0,1)$), and travels to a point 3 ft down the x-axis (at $(3,0)$) by heading straight for some point $(x,0)$ at 2 ft/sec, and then along the x-axis at 3 ft/sec. Find the value of x which minimizes the time it takes.

4. An automobile maufacturer sells, on average, 8000 cars per month at $25 thousand dollars. The marketing department has determined that for every one thousand dollar reduction in price, the company can sell an additional 500 cars per month. At what price should the car be sold so as to maximize revenue?

5. The temperature at a point x feet from a heating source is proportional to I/x^2 where I is the intensity of the source. Suppose that two heaters, one three times as intense as the other, are place 60 feet apart. At what point between the heaters is the temperature a minimum?

6. A rectangular racecourse is to be made so the diagonal measures 5 furlongs, and so we can place 20 spectators per furlong along the horizontal sides, and 30 spectators per furlong along the vertical sides. What should the dimensions of the course be so that number of spectators is the maximum?

7. Farmer Brown wants to build a right triangular chicken coop containing 100 square feet. The hypotenuse will lie on an existing wall, but the other two sides are to be built. What should the dimensions of these sides be so as to minimize the sum of their lengths?

8. The Jones Jumpersuit Company can sell $400 - 8p$ jumpersuits each month at a price of $120 + p$ dollars. Jones has fixed costs of $ 8000 per month, and the cost in labor and material for each suit is $ 25. At what price will Jones maximize profit?