1. A farmer has 2400 ft of fencing and wants to fence off a rectangular field that borders a straight river. There is no need for fencing along the river. What are the dimensions of the field that has the largest area?

2. A company wants to design a cylindrical can to hold 1 L of oil. Find the dimensions that will minimize the cost of the metal to manufacture the can.

3. What is the minimum vertical distance between the parabolas $y = x^2 + 1$ and $y = x - x^2$?

4. A retailer sells tablets. Suppose the price/demand function is $p(x) = -\frac{1}{8}x + 500$ for $x \geq 1200$.

   (a) What should the price be set at in order to maximize revenue?

   (b) If the retailer's cost function is
   $$C(x) = 35,000 + 120x$$
   what price should it choose in order to maximize its profit?

5. Find the dimensions of the largest rectangle that can be inscribed in an ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$.