1. Find two positive numbers such that the sum of the first and twice the second is 100 and their product is a maximum.

2. A person in a rowboat two miles from the nearest point on a straight shoreline wishes to reach a house six miles farther down the shore. If the person can row at a rate of 3 mi/h and walk at a rate of 5 mi/h, find the least amount of time required to reach the house. How far from the house should the person land the rowboat?

3. A piece of wire 40 cm long is to be cut into two pieces. One piece will be to form a circle, and the other will be bent to form a square. Find the lenths of the two pieces for which sum of the area of the two shapes to be a minimum. Could you make the total area of the shapes a maximum?

4. An offshore well is located in the ocean at a point W which is six miles from the closest shore point A on a straight shoreline. The oil is to be piped to a shore point B that is eight miles from A by piping it on a straight line under water from W to some shore point P between A and B and then on to B via a pipe along the shoreline. If the cost of laying pipe is \$100,000 per mile under water and \$75,000 per mile over land, how far from A should the point P be located to minimize the cost of laying the pipe? What will the cost be?

5. Find a point on the line $y = 2x + 3$ that is closest to the origin.

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