1. Divide 12 into 2 parts in a way that makes the product of one with the square of the other as large as possible.

Ans: 8 and 4

2. Divide 12 into 2 parts in a way that makes the sum of one with the square of the other as small as possible. (Careful!!)

Ans: $\frac{1}{2}, 11\frac{1}{2}$

3. Big Papa is stranded in a canoe on the Raritan river 6 miles from point A, which is the nearest point on a long straight road. He wishes to get to the Quik Chek at point B, which is 8 miles down the road. If he can row at a rate of 2 mph and walk at a rate of 6 miles per hour, find the point where he must meet the road to get to Quik Chek in the shortest time possible.

Ans: $\frac{3\sqrt{2}}{2}$ from point A

4. A rectangle is bounded below by the x axis and above by the equation $y = 7 - x^2$. Find the dimensions of the rectangle that will maximize the area.

Ans: $2\sqrt{\frac{7}{3}}$ by $\frac{14}{3}$

5. Find the height of a cylinder with maximum volume that can be inscribed in a sphere of diameter 10.

Ans: $\frac{10\sqrt{3}}{3}$

6. The volume of a cylinder is 54π. Find the dimensions that would minimize the surface area.

Answer: r = 3; h = 6

7. Given $f(x) = 2x^2 - 14x + 6$ for $0 \le x \le 12$. Find the maximum f(x) value in that domain.

Ans: f(12)=126