

4.7 – Optimization Problems

Steps for Success with Optimization Problems:

Step #1: If possible, draw a picture.

Step #2: Find two equations (one max/min and one constraint).

Step #3: Solve the constraint equation for a variable and substitute into the max/min. Now you should only have one variable.

Step #4: Differentiate and find critical points (these are the only candidates for max/min).

Step #5: Check critical points to find absolute max/min.

Step #6: Reread the question and solve.

Problems:

1. A rectangle has its base on the x -axis and its upper two vertices on the parabola $y = 12 - x^2$. What is the largest area the rectangle can have, and what are the dimensions?
2. Construct an open box with a square top and a volume of $32\,000\text{ cm}^3$. What are the dimensions of the box that use the least amount of material?
3. Find the volume of the largest cone that can fit inside a sphere of radius 3.
4. Find two numbers whose difference is 200 and whose product is a minimum.
5. Find the point on the line $6x + y = 9$ that is closest to the point $(-3, 1)$.