

**Salahaddin University-Erbil**  
**College of Engineering**  
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**1<sup>st</sup> Semester**



# **Math-I**

## **Application of Derivative**

### **Optimization (Ch.3)**

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# Optimization

To optimize something, means to maximize or minimize some aspect of it.

For Example:-

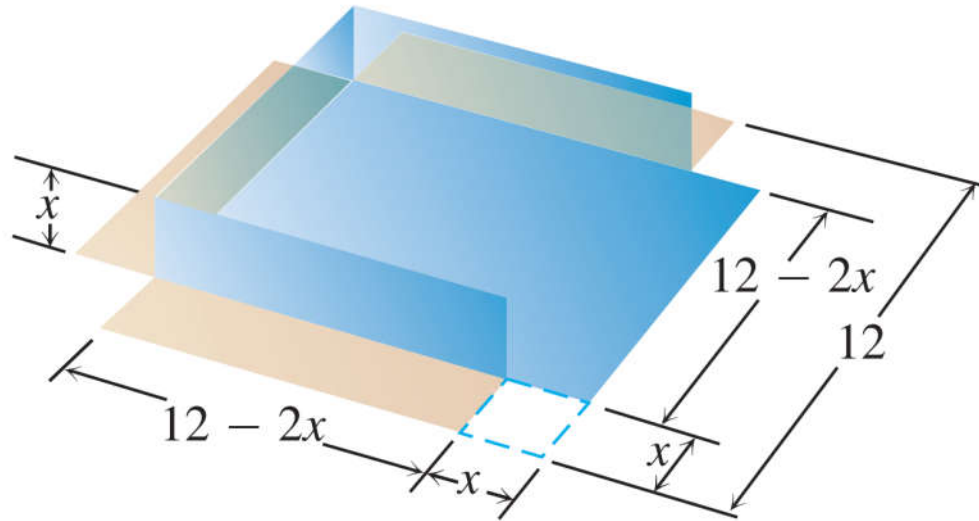
- ↪ What are the dimensions of a rectangle with fixed perimeter having maximum area?
- ↪ What is the least expensive shape for a cylindrical can?
- ↪ What is the size of the most profitable production run?

The differential calculus is a powerful tool for solving problems that call for maximizing or minimizing a function.

## Example(1)

### **Fabricating a Box**

An open-top box is to be made by cutting small congruent squares from the corners of a 12cm-by-12cm sheet of tin and bending up the sides. How large should the squares cut from the corners be to make the box hold as much as possible?



### Example(2)

A rectangular is to be fitted inside of a semicircle of radius  $2m$ , with one side along the semicircle's diameter. What is the largest area the rectangle can have? Find the dimensions and area.

### Example(3)

You have been asked to design a 1-liter can shaped like a right circular cylinder. What dimensions will use the least material?

### Example(4)

A closed container is made from a right circular cylinder of radius  $r$  and high of  $h$  with a hemispherical dome on top. Find a relationship between  $r$  and  $h$  that maximize volume for given surface area.