

Modeling with Quadratic Functions Video Lecture

Section 3.4

Course Learning Objectives:

- 1) Graph polynomial functions and use such graphs to solve applied problems and to understand the significance of attributes of the graph to such applied problems.**
- 2) Solve appropriate applications of determining the maximum or minimum of a quadratic function.**
- 3) Identify and articulate the significance of graphical components in a mathematical model/application.**

Weekly Learning Objectives:

- 1) Build function models from verbal descriptions.**
- 2) Determine exact values of maximums or minimums in quadratic application problems.**
- 3) Use a graphing utility to approximate maximum or minimum values in application problems.**

Modeling with Quadratic Functions

Guidelines for Modeling with Functions:

- 1. Express the Model in Words.** Identify the quantity you want to model and express it, in words, as a function of the other quantities in the problem.
- 2. Choose the Variable.** Identify all the variables used to express the function in step 1. Assign a symbol to one variable and express the other variables in terms of this symbol.
- 3. Create a Function.** Express the function using only the one variable chosen.
- 4. Solve.** Use the function to answer the questions posed in the problem. (To find a maximum or minimum of a quadratic function, use the algebraic vertex formula or graphical methods.)

Find the largest product that can be formed by two numbers whose sum is 23.

Find a rectangle of largest area that can be inscribed in the top half of the circle $x^2 + y^2 = 9$.

A box with an open top is to be constructed from a rectangular piece of cardboard with dimensions 12 in. by 20 in. by cutting out equal squares of side x at each corner and then folding up the sides.

- a) Find the values of x for which the volume is greater than 200 in.³.
- b) Find the largest volume that such a box can have.

A rancher with 750 ft of fencing wants to enclose a rectangular area and then divide it into four pens with fencing parallel to one side of the rectangle. Find the largest possible total area of the four pens.

A Norman window is constructed by adjoining a semicircle to the top of an ordinary rectangular window. Find the dimensions of a Norman window of maximum area if the total perimeter is 16 feet.