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.