Optimization Using Parabolas
Preliminaries and Objectives

Preliminaries
• Parabolas
• Axis of Symmetry
• Vertex
• Graph Transformations

Objectives
• Find the maximum or minimum value of a quadratic equation
Axis of Symmetry and Vertex

\[ y = ax^2 + bx + c \]

Axis of symmetry

\[ x = -\frac{b}{2a} \]

(This is also the x-coordinate of the vertex)

To find the y-coordinate of the vertex, plug the x-coordinate into the original equation.
Opens Up / Opens Down

If $a > 0$, the vertex is the minimum

If $a < 0$, the vertex is the maximum
Written by: Mike Weimerskirch
Narration: Mike Weimerskirch
Graphic Design: Robert Hank
Example 2

100 feet of fence is to be used to build a rectangular pen. What dimensions will give the maximum area?

\[2x + 2w = 100\]

\[w = 50 - x\]

Area \(= x(50 - x) = 50x - x^2\)

The maximum will occur at the vertex of the parabola \(50x - x^2\), so

\[x = -\frac{50}{2(-1)} = 25\]

Therefore \(w = 50 - 25 = 25\) and the area of the pen is \((25)(25) = 625\) square feet.