3.7 Optimization Problems

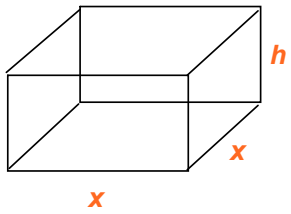
What will you learn?

- **Solve applied minimum and maximum problems**

Example 1 - Finding Maximum Volume

A manufacturer wants to design an open box having a square base and a surface area of 108 square inches.

What dimensions will produce a box with maximum volume?



Guidelines for Solving Applied Min & Max Problems

1. Identify all given quantities
   Identify what you're asked to find
   Make a sketch

2. Write a PRIMARY EQUATION for the quantity that is to be maximized or minimized

3. Reduce the primary equation to a SINGLE INDEPENDENT VARIABLE

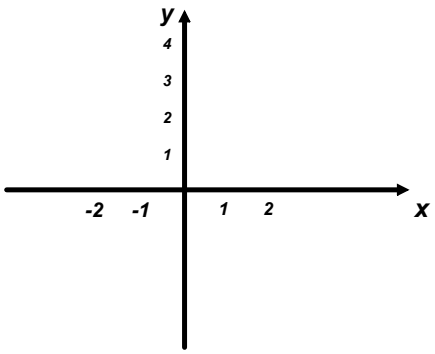
   This may require the use of a SECONDARY EQUATION relating the independent variable in the primary equation

4. Determine the FEASIBLE DOMAIN of the primary equation

5. Determine the desired max or min by using calculus techniques

Example 2 - Finding MINIMUM DISTANCE

Which points on the graph of $y = 4 - x^2$ are closest to the point $(0, 2)$?



Example 3 - Finding MINIMUM LENGTH

Two posts, one 12 feet high and the other 28 feet high, stand 30 feet apart.

They are to be stayed by two wires, attached to a single stake, running from ground level to the top of each post.

Where should the stake be placed to use the least amount of wire?

Example 4 - Finding MINIMUM AREA

A rectangular page is to contain 24 square inches of print.
The margins at the top and the bottom of the page are to be 1½ inches.
The margins on the left and the right are to be 1 inch.
What should the dimensions of the page be so that the least amount of paper is used?

Example 5 - AN ENDPOINT MAXIMUM

Four feet of wire is to be used to form a square and a circle.
How much of the wire should be used for the square and
how much should be used for the circle to enclose the maximum total area?