Optimization

w-up: Express the perimeter of a rectangle in terms of its length(l) knowing that the area MUST be 150 sq. ft.

To find the **maximum**/**minimum** for **any function**, we apply the first derivative test and determine if a sign change occurs.

To solve optimization applications problems

1) Write a formula related to the problem so that the DEPENDENT(traditionally the y-value) variable is the quantity to be minimized/maximized.

2) Reduce the equation to having a single independent variable(traditionally the x-value) which sometimes involves a secondary equation.

3) Differentiate the equation and set it equal to zero. Solve the equation and use these critical values to verify that it occurs at a min/max a formula related to the problem so that the DEPENDENT variable is the quantity to be minimized/maximized.

EXAMPLES

1) A rectangular box with square base must have a volume of 43 cubic centimeters. What should the dimensions of the base become to minimize surface area, thus minimizing the cost to wrap it?

2) Find two positive numbers whose product is 405 and sum is minimum

3) Find the point on the graph of the function $f(x) = -2x^2$, which is closest to the point (0, -8)

4) Twenty feet of wire is used to form an equilateral triangle and a square. How much should be used for each figure so the total enclosed area is minimum?