Section 4.6

I. Optimization Algorithm

A. Draw a figure; label relevant quantities with variables

B. Identify the quantity (label with a variable) which is to be optimized; find a formula (for the quantity which is to be optimized) in terms of the other relevant quantities (in Step A)

C. Use problem conditions to reduce the number of independent variables in the optimization formula (in Step B) to one independent variable

D. Identified relevant (realistic) domain restrictions on the independent variable in the formula (for the quantity which is to be optimized in Step C)

E. Use calculus to find local/absolute extreme value of the optimization variable

Examples

Pasture Area A farmer needs to fence off a pasture which is bordered on one side by a river. Find the dimensions of the rectangle with maximal area which can be enclosed by 500 yards of fencing if one of the bounding sides of the rectangle is river. What will the maximum fencible pasture area be?

Cylinder Volume A manufacturer of cans for a company that markets chicken noodle soup. The soup company needs the cans to hold 20 in^3 of soup. The metal for the ends of the cans is more expensive than the metal for the sides of the cans:

metal for the ends : \$0.005 / in^2
metal for the sides: \$0.0035 / in^2

How should the dimensions of the cans be set to minimize the cost for making the cans?

Window Construction The rectangular window will is to be constructed so that it will fit inside a semi-circular arch whose base is10 ft in length. What dimensions should the window have to maximize the amount of light coming through it?

Maximum Yield A fruit grower estimates that if 60 trees are planted per acre then the average yield per tree will be 180 lbs of fruit. More trees per acre can be planted, but then the average yield goes down by 2.5 lbs of fruit per tree. How many trees should be planted per acre to maximize the total yield?

Maximum Yield Data from the Enrollment Management office at Texas Tech shows that with the current tuition charge per credit hour set at $170 there are 24,000 students attending Texas Tech. The Enrollment Management office projects that for each $2 decrease in the tuition charge per credit hour that the actual enrollment will increase by 500 students. What tuition charge per credit hour (whole dollars) should the Enrollment Management office recommend so as to maximize the total revenue collected from tuition payments?