# Math 220 - Calculus f. Business and Management - Worksheet 44-45

## Worksheet 44 - 45 - LaGrange Multipliers

*Exercise 1:*

*A rectangular enclosure is to be built. The East and West sides cost $6 per meter. The North and South sides cost $5 per meter. What is the biggest area that can be achieved for $1,500?*

*Find the lowest cost option for this situation applying the method learned in earlier optimization problems (find critical points of a function of a single variable ...)*

*Exercise 2:*

*Solve the problem in exercise 1 using LaGrange multipliers instead.*

*Exercise 3:*

*Solve these problems from your textbook using LaGrange Multipliers: Problems 4, 6 and 8*

*Exercise 3-A - Textbook problem 4:*

*A company has two plants that produce diamond necklaces. At plant A, it costs $x^2 + 1,200$ dollars to make $x$ necklaces. At plant B, it costs $3y^2 + 800$ dollars to make $y$ necklaces. An order has come to the company for 1,200 necklaces. (a) How many necklaces should be made in plant A and how many necklaces should be made in plant B if the company wishes to minimize the cost? (b) If the company charges the customer $1,000 for each necklace, how much profit will they make from this order?*

*Exercise 3-B - Textbook problem 6:*

*The total cost to produce $x$ widgets and $y$ bidgets is given by $C(x,y) = 3x^2 + 4y^2 + 2xy + 3$. If a total of ten items must be made, how should production be allocated so that total cost is minimized?*

*Exercise 3-C - Textbook problem 8:*

*Find the dimensions that will minimize the surface area (and hence the cost) of a rectangular tank, open on top, with a volume of 32 cubic feet.*

*Hint: There are 4 variables (including $\lambda$) in this problem.*
*a) Solve $F_x$ and $F_y$ for $\lambda$ and set the results equal to each other and solve for $y$.*
*b) Use the solution for $x$ in $F_z$ to find $\lambda$.*
*c) use $F_y$ and $F_\lambda$ to finish the problem*