

Homework #5 – MATH 3250
Fall 2005

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Name : _____

Directions: Attach this cover sheet to your ENGINEERING PAD PAPER!!!

1. Consider the Chicken Coop Problem.

We have a fixed number of yards of fencing.

All of the coops have the same area, xy .

There are m horizontal segments and n vertical segments.

Thus, we want to maximize

$$f(x, y) = xy$$

subject to the constraint

$$mx + ny = C.$$

[We are assuming that it makes no sense to have any unused fencing.]

SHOW that the maximum value of f is attained when we divide C into two halves and that

$$mx = \frac{C}{2} \quad \text{and} \quad ny = \frac{C}{2}.$$

[Obviously, this is equivalent to showing that $mx = ny$.]

2. Find an appropriate Calc. III reference (textbook or website) which gives the steps for solving a Lagrange Multiplier problem.

(a) Explain SPECIFICALLY how the Chicken Coop Problem must be restated when $g(x, y)$ is used in the constraint portion of the problem.

(b) Solve the problem using Lagrange Multipliers, i.e., the system

$$\begin{aligned} \nabla f &= \lambda \nabla g \\ mx + ny &= C \end{aligned}$$

gives us the appropriate Lagrange point (which is a maximum for f).

3. Solve Problem 7.19(iii) carefully.

You must fill in the algebraic details!

For example, show $x(a, b) = \frac{1}{6} \left((a + b) - \sqrt{a^2 - ab + b^2} \right)$.

This is the best value of x when a and b are fixed.

Now use L'Hôpital to find the limit as $b \rightarrow +\infty$.