MA104 Lesson 58

LESSON 58 - LAGRANGE MULTIPLIERS II

Friday, 02 May, 2008

Outline

1. Admin
2. Last Class
3. LAGRANGE MULTIPLIERS II
   - Steps for LaGrange Multipliers
   - Examples
   - Board Work
   - Do Problem Help
4. Look Forward - Problem Solving Lab

Admin

1. Project is due Today in class.

Admin

2. WPR IV is on Friday, 9 May. If you will not be there let me know now.

Admin

3. WPR - Non Technical Portion (4 questions - 140 points), Technical Portion (2 questions - 110 points)

Admin

4. Make sure you try the block problems as you study for the exam!

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5. New Block IV Review - with LaGrange is on the web site.

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6. LaGrange Template is on the web site.

Lesson 57 - LaGrange

Questions?

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Steps for LaGrange Multipliers

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3. Find the gradient of both the Objective and Constraint Equation $\nabla Ob, \nabla Co$ by taking the partial derivatives and putting them in vector notation.
   $\nabla Ob(x, y) = \langle 4, 6 \rangle$,
   $\nabla Co(x, y) = \langle 2x, 2y \rangle$

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   $\nabla Ob(x, y) = \langle 4, 6 \rangle$,
   $\nabla Co(x, y) = \langle 2x, 2y \rangle$
4. Set $\nabla Ob(x, y) = \lambda Co(x, y)$.
   $\langle 4, 6 \rangle = \lambda \langle 2x, 2y \rangle$

Steps for LaGrange Multipliers

5. Solve the equations $\nabla Ob(x, y) = \lambda Co(x, y)$ and $Co(x, y) = k$ for all values of x, y, λ by solving the system of three equations and three unknowns. In this case I would solve the first equation for λ giving $\lambda = \frac{2}{x}$. I would then sub λ into the second equation. $6 = 2y(\frac{2}{x})$. I would solve the second equation for x giving $x = \frac{2y}{3}$. Finally I would sub the x into the final equation $(\frac{2y}{3})^2 + y^2 = 13$ This would give $\frac{4y^2}{9} + y^2 = 13$. So $y = \pm 3$ then $x = \pm 2$.

Steps for LaGrange Multipliers

5. Solve the equations $\nabla Ob(x, y) = \lambda Co(x, y)$ and $Co(x, y) = k$ for all values of x, y, λ by solving the system of three equations and three unknowns. In this case I would solve the first equation for λ giving $\lambda = \frac{2}{x}$. I would then sub λ into the second equation. $6 = 2y(\frac{2}{x})$. I would solve the second equation for x giving $x = \frac{2y}{3}$. Finally I would sub the x into the final equation $(\frac{2y}{3})^2 + y^2 = 13$ This would give $\frac{4y^2}{9} + y^2 = 13$. So $y = \pm 3$ then $x = \pm 2$.
6. Evaluate Ob at all the points (x, y). The largest of these values is the max; the smallest is the minimum. In our case $Ob(2, 3) = 26$ and $Ob(-2, -3) = -26$

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Examples

1. Distance to a road!

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Board Work

1. Find Max & Min of $f(x, y) = 4x + 6y$ subject to the constraint $x^2 + y^2 = 13$.
2. Find Max & Min of $f(x, y) = e^{xy}$ subject to the constraint $x^3 + y^3 = 16$.

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DO Problems

1. Section 14.7/ 3, 5, 7, 9, 11
2. Section 14.7/ 30, 32, 33
3. Section 14.7/ 39, 43, 46
4. Section 14.7/ 48, 50, 51
5. Section 14.7/ 52, 54
6. Section 14.8/ 1, 3, 5, 7, 8

Block Problems and Block IV Review

1. OBJECTIVES:
    1. Review Block IV
2. READ:
    1. Block IV Problems
3. DO:
    1. Block IV Problems
    2. Bring Problems you think would be on the exam.

Questions?

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