

MTE 203 – Advanced Calculus

Homework 8

Relative and Absolute Maxima and Minima

Problem 1: [12.10, Prob. 3]

Find all the critical points for the given function and classify each as yielding a relative maximum, a relative minimum, a saddle point, or none of these.

$$f(x, y) = x^3 - 3x + y^2 + 2y$$

Problem 2: [12.10, Prob. 13]

Find all the critical points for the given function and classify each as yielding a relative maximum, a relative minimum, a saddle point, or none of these.

$$f(x, y) = (1 - x)(1 - y)(x + y - 1)$$

Problem 3: [12.11, Prob.3]

Find the maximum and minimum values of the function on the region:

$f(x, y) = 3x + 4y$ on region R bounded by the lines $x + y = 1$, $x + y = 4$, $1 + y = x$, and $y - 1 = x$,

Constrained Maxima and Minima

Problem 4: [12.11, Prob. 15]

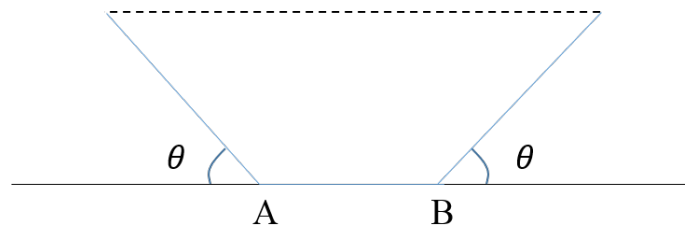
- a. When a rectangular box is sent through the mail, the post office demands that the length of the box plus twice the sum of its height and width be no more than 250 cm. Find the dimensions of the box satisfying this requirement that encloses the largest possible volume.
- b. **[Optional]** Verify your answer by solving the problem using Lagrange multipliers.

Problem 5: [12.11, Prob. 25]

Find the maximum and minimum values of $f(x, y) = |x - 2y|$ on the curve $|x| + |y| = 1$.

Problem 6: [12.11, Prob.31]

A long piece of metal 1 m wide is bent at A and B, as shown in the figure below, to form a channel with three straight sides. If the bends are equidistant from the ends, where should they be made in order to obtain maximum possible flow of fluid along the channel?

**Lagrange Multipliers****Problem 7: [12.12, Prob.3]**

Use Lagrange multipliers to find the maximum and minimum values of the given function subject to the constraints. Also interpret the constraint geometrically.

Problem 8: [12.12, Prob.27]

Find the maximum value of $f(x, y, z) = x^2yz - xzy^2$ subject to constraints $x^2 + y^2 = 1$, $z = \sqrt{x^2 + y^2}$

Warm-Up Problems

Solutions to these problems can be found at the back of your textbook

1. S. 12.10, Probs. 2, 6, 10, 18,
2. S. 12.11, Probs. 2, 4, 10
3. S. 12.12, Probs. 2, 4, 8

Extra Practice Problems

Solutions to these problems can be found at the back of your textbook

1. S. 12.10, Probs. 8, 12, 20
2. S. 12.11, Probs. 12, 20, 30, 32
3. S. 12.12, Probs. 18, 24, 26, 28

Extra Challenging Problems

Solutions to these problems can be found at the back of your textbook

1. S. 12.10, Probs. 22
2. S. 12.11, Probs. 28, 38
3. S. 12.12, Probs. 22, 34