MATH 2415 Calculus of Several Variables

Fall-2019

PLTLWeek-9 (Sec 14.7B, 14.8)

---

1. Find the absolute maximum and the absolute minimum values of the following functions on the given region R

   (a) $f(x, y) = 4 + 2x^2 + y^2;\ R = \{(x, y) : -1 \leq x \leq 1, -1 \leq y \leq 1\}$

   (b) $f(x, y) = 6 - x^2 - 4y^2;\ R = \{(x, y) : -2 \leq x \leq 2, -1 \leq y \leq 1\}$

   (c) $f(x, y) = 2x^2 + y^2;\ R = \{(x, y) : x^2 + y^2 \leq 16\}$

   (d) $f(x, y) = x^2 + y^2 - 2x - 2y;\ R =$ the closed triangular region with the vertices at $(0, 0), (2, 0), (0, 2)$

2. Rectangular boxes with volume of 10 m^3 are made of two materials. The material for the top and the bottom of the box costs $\$10/m^2$ and the material for the sides costs $\$1/m^2$. Find the dimensions of the box that minimize the cost of the box.

3. Use Lagrange multipliers to find the maximum and minimum of $f(x, y)$ subject to the given constraint (The maximum and minimum both exist).

   (a) $f(x, y) = xy^2$ subject to $x^2 + y^2 = 1$

   (b) $f(x, y) = e^{2xy}$ subject to $x^2 + y^2 = 16$

   (c) $f(x, y) = xe^y$ subject to $x^2 + y^2 = 2$

   (d) $f(x, y) = x^2 - y^2$ subject to $x^2 + y^2 = 1$

4. Find the absolute maximum and minimum values of $f(x, y)$ over the region R (Use Lagrange multiplier to determine the extreme values on the boundary.)

   (a) $f(x, y) = x^2 + 4y^2 + 1;\ R = \{(x, y) : x^2 + 4y^2 \leq 1\}$

   (b) $f(x, y) = (x - 1)^2 + (y + 1)^2;\ R = \{(x, y) : x^2 + y^2 \leq 4\}$

   (c) $f(x, y) = 2x^2 + y^2 + 2x - 3y;\ R = \{(x, y) : x^2 + y^2 \leq 1\}$

   (d) $f(x, y) = e^{-xy};\ R = \{(x, y) : x^2 + 4y^2 \leq 1\}$