Homework and Quiz 9

Due Wednesday, July 15, 2009

Ungraded homework

For practice, do

> Section 15.7, page 966, problems 5, 7, 9, 11, 13, 19, 29, 31, 33, 41, 43.
> Section 15.8, page 976, problems 3, 5, 7, 9, 11, 19, 21, 25, 41, 45.

The very last problem (problem 45 in section 15.8) is a real classic: the *AM–GM inequality* that relates arithmetic means to geometric means.

Graded Quiz

(a) Find the local extrema of the function $f : \mathbb{R}^2 \to \mathbb{R}$ given by

$$f(x, y) = 2\,x^3\,y + 24\,x^2 - 16\,y.$$

(b) Define $D = \{(x, y) \in \mathbb{R}^2 : x \in [0, 4] \text{ and } y \in [0, 5]\}$. Find the global extrema of the function $f : D \to \mathbb{R}$ given by

$$f(x, y) = 4x + 6y - \left(x^2 + y^2\right).$$

(c) You work for a box company: to save costs, find the dimensions of the box with minimal surface area that encloses 10^3 cubic inches.

(d) Let $C = \{(x, y) \in \mathbb{R}^2 : x^2 + y^2 = 1\}$. Find the local extrema of the function $f : C \to \mathbb{R}$ given by

$$f(x, y) = x^2 + 2\,y^2.$$

(e) Use Lagrange multipliers to find the global extrema of the function

$$f(x, y, z, w) = x + y + z + w$$

subject to the constraint $g(x, y, z, w) = x^2 + y^2 + z^2 + w^2 = 1$.