

**Mini-Problems 10**

1. Find the largest possible area of a rectangular box having diagonal length  $L$ .
2. Find the extreme values of  $f(x, y) = 2x^2 + 3y^2 - 4x - 5$  on the region defined by  $x^2 + y^2 \leq 16$ .
3. Find the extreme values of  $f(x, y) = xy^2$  on the region  $\{(x, y) : x \geq 0, y \geq 0, x^2 + y^2 \leq 3\}$ .
4. Consider the problem of minimizing the function  $f(x, y) = x$  on the curve  $y^2 + x^4 - x^3 = 0$ . (i) What candidate for a minimum does the Lagrange multiplier method give you? (ii) Show (from scratch) that the actual minimum is 0. (iii) Why does the Lagrange multiplier method fail to give the correct answer here?