Exercise sheet #2

Lagrange Multiplier and min/max problems

1) Find the min and max of $f(x,y) = y^2 - 4x^2$ subject to the constraint $x^2 + 2y^2 = 4$.

2) Find the minimum and maximum distance betweet the ellipse $x^2 + xy + 2y^2 = 1$ and the origin.

3) Find the absolute min and max of $f(x,y) = x^2 - 4y^2 + xy$ on the region $R = \{(x,y) \in \mathbb{R}^2 : 4x^2 + 9y^2 \leq 36\}$

4) A lidless cardboard box is to be made with volume $4\,m^3$. Find the dimensions of the box that require the least amount of cardboard.

5) ~~Find the absolute min and~~ Find the critical points of the following functions and decide if they are loc. min. loc. max. or saddle points:

(a) $f(x,y) = x^4 + 2y^2 - 4xy$

(b) $f(x,y) = 2xy\, e^{-x^2-y^2}$