HOMEWORK ASSIGNMENT 5

Due date: Wednesday, February 13, 2019, at 9:30 AM.

Objective: To write and run a python program to solve an integer programming problem.

Problem: Let

$$f(x,y) = (x-1)^2 - 4*(x-1)*(y-3) + 5*(y-3)^2 - 841$$

The equation $f(x,y) = 0$ defines an ellipse in the xy-plane. Let C denote the convex region in the xy-plane defined by $f(x,y) \leq 0$. The *boundary* of C is the ellipse $f(x,y) = 0$ itself. The *lattice points* in the xy-plane are those ordered pairs (x,y) for which both x and y are integers. This problem is concerned with finding extremal lattice points in C, and extremal lattice points on the boundary of C. Write a python program that does all of the following:

(1) Count the number of lattice points in C.
(2) Count the number of lattice points on the boundary.
(3) Locate the minimum x value for all lattice points in C.
(4) Locate the maximum x value for all lattice points in C.
(5) Locate the minimum y value for all lattice points in C.
(6) Locate the maximum y value for all lattice points in C.
(7) Locate the lattice point in C closest to the origin.
(8) Locate the lattice point in C farthest from the origin.
(9) Locate the lattice point on the boundary of C closest to the origin.
(10) Locate the lattice point on the boundary of C farthest from the origin.