For #1 and #2, find and classify the critical point of each function.

1. $f(x,y) = 4x^2 + 2y^2 - 2xy - 10y - 2x + 1$

Finding the critical point:

a. Take the partial derivative of ***f*** with respect to x and set it equal to zero.

b. Take the partial derivative of ***f*** with respect to y and set it equal to zero

c. Set up a system of equations, rewriting them so you can use matrices.

d. Write the [A], [X], and [B] matrices.

e. Solve the system [A][X]=[B] on your calculator and report your answers.

f. Find the output value at the critical point.

Classifying the critical point:

g. Find the second partials of f(x,y). Write the second partials matrix.

h. Find the value of the determinant of the second partials matrix you found in part g.

i. Use the determinant test to classify the optimal point. Specifically state how you decided on the type of point.

2. Find and classify the critical point of $f(x,y) = 2x^2 + 2xy + 6x + 4y + 10$

3. The function $f(x,y) = 4xy - x^4 - y^4$ has three critical points, (0,0,0), (1,1,2) and (-1,-1,2).

Classify each point as a relative maximum, relative minimum or saddle point.

Hint: You should find the second partial matrix before you begin.

Work for the point (0,0,0):

The point (0,0,0) is a _____

Work for the point (1,1,2):

The point (1,1,2) is a _____

Work for the point (-1,-1,2):

The point (-1,-1,2) is a _____