ECON 301 Tutorial #1 Homework

The following are 2–variable optimization problems, both unconstrained and constrained.
Prepare them for your first tutorial. If you have difficulty, review the notes
"Optimizaion and Economics" found on the website
SHORT ANSWER. Attempt the following. FINDING second order conditions are OPTIONAL (See notes on webpage)

1) Determine the critical points of $f(x, y) = 3x^2 + 4y^2 - 2x + 8y$ and also determine by the second–derivative test whether each point corresponds to a relative maximum, to a relative minimum, to neither, or whether the test gives no information. 1) _____

2) Determine the critical points of $f(x, y) = 4x^2 + 2x - y^2 + 2y$ and also determine by the second–derivative test whether each point corresponds to a relative maximum, to a relative minimum, to neither, or whether the test gives no information. 2) _____

3) Determine the critical points of $f(x, y) = x^2 + 2xy + 2y^2 - 4y$ and also determine by the second–derivative test whether each point corresponds to a relative maximum, to a relative minimum, to neither, or whether the test gives no information. 3) _____

4) Determine the critical points of $f(x, y) = 2xy - 3x - y - x^2 - 3y^2$ and also determine by the second–derivative test whether each point corresponds to a relative maximum, to a relative minimum, to neither, or whether the test gives no information. 4) _____

5) Use the method of Lagrange multipliers to determine the critical points of $f(x, y) = 4x^2 + 2y^2 + 3$ subject to the constraint $x + 2y = 9$. 5) _____

6) Use the method of Lagrange multipliers to determine the critical points of $f(x, y) = x + 2y$ subject to the constraint $xy = 8$. 6) _____

7) Use the method of Lagrange multipliers to determine the critical points of $f(x, y, z) = x^2 - 3y^2 - z^2 + 6$ subject to the constraint $5x - 3y + z = 21$. 7) _____

8) The production function for a company's product is $Q = 100L + 50k - L^2 - k^2$, where Q is the output that results from L units of labor and k units of capital. The unit costs of labor and capital are 6 and 3, respectively. If the company wants the total cost of inputs to be 30, determine the greatest output possible subject to this budget constraint. 8) _____