In Class Practice Sheet on Multivariable Calculus:

1) Using pencil and paper:
   a) Graph the level curves for \( f(x, y) = x^2y \) for \( C = 14, C = 30, C = 57 \) for positive values of \( x \) and \( y \).
   b) Find the cross section for \( f(x, y) = x^2y \) when \( y = -4 \).

2) If Revenue is given to be \( R(x, y) = -x^2 - 3y^2 + 16x + 42y \), find the point \((x, y)\) that will give the maximum Revenue and verify that it is indeed the max.

3) If \( f(x,y) = 300 + x^2 + y^2 - xy -15x - 30y \) find all possible critical points and then verify if they are a relative maximum, relative minimum or a saddle point.

4) If \( f(x,y) = x^3 + y^2 - 27x -20y + 100 \) find all possible critical points and then verify if they are a relative maximum, relative minimum or a saddle point.

5) The joint cost function per day for making robot dogs and cats is given by

\[
C(x, y) = 40 + 3x^2 + y^2 + xy + 100
\]

where \( x \) is the number of robot dogs and \( y \) is the number of robot cats.

   a) Find the marginal cost with respect to \( x \) if 20 units of \( x \) and 15 units of \( y \) are produced. Explain the information that the results give you.

   b) Find the marginal cost with respect to \( y \) if 10 units of \( x \) and 18 units of \( y \) are produced. Explain the information that the results give you.

   c) What is the total cost if 8 units of \( x \) and 5 units of \( y \) are produced? Determine if this is a critical point without solving for it.

6) A company is comparing two products to determine if they are competitive or complementary. Can you decide the final answer for them, if the company has the following equations relating the quantity of one product with the price of both products?

\[
\begin{align*}
Q_A &= 5P_A - 3P_B + 10 \\
Q_B &= -2P_A + 4P_B + 20
\end{align*}
\]