MA 122: Worksheet 5
Discussion on 3/14 or 3/16

PROBLEM 1. Given a function $f(x, y)$, we have a procedure for finding the local extrema and saddle points of $f(x, y)$. To summarize (and try to not look at your notes first):

a) Find the critical points, i.e. the solutions to the equations:

b) Calculate the values:
   
   i) $A =$
   ii) $B =$
   iii) $C =$
   iv) $D =$

c) To decide what kind of point each critical point is, use
   
   i) Max if $D _____$ and $A _____$
   ii) Min if $D _____$ and $A _____$
   iii) Saddle point if $D _____$
   iv) If $D = 0$, ______________

PROBLEM 2. Given a function $f(x, y)$ and a constraint $g(x, y) = 0$, to optimize $f$ subject to the constraint, we actually want to find the critical points of

$$F(x, y, \lambda) =$$

PROBLEM 3. What’s the difference between a regular optimization problem and a Lagrange multiplier problem?
PROBLEM 4. Optimize $f(x, y) = x^3 + y^2 - 6xy + 9x + 5y + 2$ using the second derivative test.
Problem 5. Optimize $f(x, y) = 81x^2 + y^2$ subject to $4x^2 + y^2 = 90$. 