MA104 - Differential Calculus
Lesson 50: Extrema Of Functions Of Two Variables I

Have your book open to the Second Derivative Test on page 924 while working these problems.

1. By hand, find the critical points of the function $f(x,y) = x^3y + 12x^2 - 8y$. Use the Second Derivative Test to classify each as a local maximimum, local minimum, or a saddle point.

2. Find the critical points of the function $f(x,y) = 2x^3 + xy^2 + 5x^2 + y^2$, by hand or using Mathematica. Use the Second Derivative Test to classify each as a local maximimum, local minimum, or a saddle point.

3. Find the critical points of the function $f(x, y) = x^2 - y^2 + 5e^{-x^2}$. Use the Second Derivative Test to classify each as a local maximum, local minimum, or a saddle point. Plot $f(x, y)$ in Mathematica as confirmation of your results. (If you found the critical points by hand, ensure that you have 3 of them!)

4. (Use Mathematica for this problem!) Find the point on the plane $x - y + z = 4$ that is closest to the point $(1, 2, 3)$. (Hint: You need to write down a 2 variable function that gives a formula for the distance between these two objects...)