

Written HW6 – MATH 3503 Fall 2022

In this homework you will do some optimization problems. Full credit submissions will contain an entirely symbolic derivation of the results as well as addressing all aspects of the problem.

1. Find and classify the critical points of the function

$$f(x, y) = x^3y + 12x^2 - 8y.$$

Plot this function in CalcPlot3D and indicate in the picture where the critical points are – make sure they are visible in your attached image(s) by placing a point on the surface where relevant.

2. For functions of one variable, it is impossible for a continuous function to have two local maxima and no local minimum. Try to explain why that could be (hint: draw a picture).

After you explain the above, show that the function

$$f(x, y) = -(x^2 - 1)^2 - (x^2y - x - 1)^2$$

has only two critical points, but it has a local maximum at both. Plot this function in CalcPlot3D and indicate in the picture where the critical points are – make sure they are visible in your attached image(s) by placing a point on the surface where relevant.