Practica 2 de MN2

November 10, 2020

We want to compute the graph of the curves of $\mathbb{R}^2$ defined by $f(x, y) = 0$, where

$$\begin{aligned} f(x,y) &= 4y^6 - 2y^5 + 30x^2y^4 - 2xy^4 - 30y^4 - 2x^2y^3 + 5y^3 + 5x^4y^2 - 2x^3y^2 \\ &- 21x^2y^2 + 32xy^2 + 20y^2 + 18x^2y - 36y + 9x^4 + 18x^3 - 40x^2 - 36x - 8 \end{aligned}$$

1. Write C functions that, given a point (x, y), computes $f(x, y)$ and $\nabla f(x, y)$.

2. Use newton method to compute points on the curves (**hint:** compute an intersection of the curve with one of the coordinate axis).

3. Suppose that we know (x_0, y_0) such that $f(x_0, y_0) = 0$. Write a C function that, given a suitable first guess, uses Newton method to find a zero of $f(x, y)$ at a distance h from (x_0, y_0). Note: consider the system of equations

$$\begin{aligned} f(x,y) &= 0, \\ (x - x_0)^2 + (y - y_0)^2 &= h^2 \end{aligned}$$

4. Write a C program to compute using the continuity method and write in a file values of the (closed) curve such that $f(C) = 0$ using as a distance between points the value $h = 0.001$. Use **gnuplot** to plot the curve
(**hint:** use the unitary tangent vector to the curve at a given point to obtain a suitable first guess for the next point).