

Exercise 3e (2D Newton)

Consider the functions $f(x,y) = xy - 1$

$$\text{and } g(x,y) = x^2 + y^2 - 4$$

1) Make a plot of the curves:
(Matlab)

$$f(x,y) = 0 \text{ and } g(x,y) = 0$$

How many solutions (x,y) exist?

2) Describe the Newton-Raphson method

for the system $\begin{cases} f(x,y) = 0 \\ g(x,y) = 0 \end{cases}$

Determine the Jacobian matrix.

3) Perform an experiment with the iteration formula
(Matlab) from part 2). Choose as initial guess $(x_0, y_0) = (2, \frac{3}{5})$.

Calculate $(x_1, y_1), (x_2, y_2), \dots, (x_{10}, y_{10})$.

4) Plot these points in the (x,y) -plane.
(Matlab)