## Analysis III for Engineering Students Sheet 5, Homework

## Exercise 1:

(See lecture page 95)

For the function

$$f(x, y, z) = xy + z^2$$

find the global extrema on the intersection of the cylinder surface

$$g(x, y, z) = x^2 + y^2 - 8 = 0$$

and the plane

$$h(x, y, z) = x - y + 2z - 1 = 0.$$

Hint: First check the regularity condition.

Exercise 2: Given the nonlinear system of equations

$$\boldsymbol{f}(\boldsymbol{x}) := \begin{pmatrix} 4x_1^3 - 27x_1x_2^2 + 25\\ 4x_1^2 - 3x_2^3 - 1 \end{pmatrix} = \begin{pmatrix} 0\\ 0 \end{pmatrix}$$

find an approximation for a solution in the neighbourhood of  $\boldsymbol{x}^{[0]} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ . To do this perform at least two steps of the Newton iteration starting with  $\boldsymbol{x}^{[0]}$ .

**Hand in until:** 20.12.24