

List 6 IBI 5081 – Optimization I.

1. By Newton method find the first-step approximation for the root, using the initial approximation $x_0 = y_0 = z_0 = 0.5$:

$$\begin{cases} x^2 + y^2 + z^2 = 0 \\ 2x^2 + y^2 - 4z = 0 \\ 3x^2 - 4y + z^2 = 0 \end{cases}$$

Make three steps of iteration method and find approximate value of the root. (obs: it seems that should be smth like $x = 0.78521$, $y = 0.49662$, $z = 0.36992$)

2. By sequential iteration method find the maximal root of the equations

- (1) $x^3 + x = 1000$;
- (2) $4x - 5 \ln(x) = 5$;
- (3) $e^x - 10x = 0$;

with precision $\varepsilon = 10^{-3}$ (using a software). Derive the iteration formula and calculate the first approximation explicitly.

3. Apply Newton method in order to find the maximum of the function

$$f(x, y) = x^4 + y^5 - 2xy + x^2 - y^2.$$

Write the iteration formula and find the first approximation starting from the point $(1, 1)$.