Ex.: (4) For example (3)

$$D\vec{f}(\vec{x}) = \begin{pmatrix} \frac{\partial f_1}{\partial x_1} = 2x_1 & \frac{\partial f_1}{\partial x_2} = 1 \\ \frac{\partial f_2}{\partial x_1} = x_2 \cdot e^{x_1} & \frac{\partial f_2}{\partial x_2} = e^{x_1} \end{pmatrix} = \begin{pmatrix} 2x_1 & 1 \\ x_2 \cdot e^{x_1} & e^{x_1} \end{pmatrix}$$

$$D\vec{f}^{-1}(\vec{x}) = \frac{1}{(2x_1 - x_2)\cdot e^{x_1}} \begin{pmatrix} e^{x_1} & -1 \\ -x_2 \cdot e^{x_1} & 2x_1 \end{pmatrix}$$

$\rightsquigarrow$ Slides

$$A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$$

$$A^{-1} = \frac{1}{ad - cb} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$$

(5) CSTR

$\rightsquigarrow$ Slides

Rem.: (i) Needs Jacobian

(ii) Quadratic convergence when close enough

(iii) Fails when Jacobian singular

i.e. $D\vec{f}$ not invertible

... $\sim f'(x) = 0$ ...

04.10.23