Zad 2.

$$f\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} u(x,y) \\ v(x,y) \end{pmatrix}$$

$$u(x+h_1, y+h_2) \cong u(x,y) + h_1 \cdot \frac{\partial u}{\partial x} + h_2 \cdot \frac{\partial u}{\partial y}$$

$$v(x+h_1, y+h_2) \cong v(x,y) + h_1 \frac{\partial v}{\partial x} + h_2 \cdot \frac{\partial v}{\partial y}$$

$$f\begin{pmatrix} x+h_1 \\ y+h_2 \end{pmatrix} = f\begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} h_1 \\ h_2 \end{pmatrix} \underbrace{\begin{pmatrix} \frac{\partial u}{\partial x} & \frac{\partial v}{\partial y} \\ \frac{\partial v}{\partial x} & \frac{\partial v}{\partial y} \end{pmatrix}}_{J} = 0$$

bo szukamy pierwiastków

$$f\begin{pmatrix} x \\ y \end{pmatrix} + J\begin{pmatrix} h_1 \\ h_2 \end{pmatrix} = 0$$

$$f\begin{pmatrix} x \\ y \end{pmatrix} + J\begin{pmatrix} x+h_1-x \\ y+h_2-y \end{pmatrix} = 0$$

$$J\begin{pmatrix} x+h_1-x \\ y+h_2-y \end{pmatrix} = -f\begin{pmatrix} x \\ y \end{pmatrix}$$

$$\begin{pmatrix} x+h_1 \\ y+h_2 \end{pmatrix} - \begin{pmatrix} x \\ y \end{pmatrix} = -J^{-1}\begin{pmatrix} x \\ y \end{pmatrix}$$

$$\begin{pmatrix} x+h_1 \\ y+h_2 \end{pmatrix} = \begin{pmatrix} x \\ y \end{pmatrix} - J^{-1}\begin{pmatrix} x \\ y \end{pmatrix}$$

wyprowadzony Newton 2D