

a) LET $F: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ BE DEFINED BY $F(x) = \begin{pmatrix} x_1 \\ x_2 + x_2^3 \end{pmatrix}$.

CONSIDER BROYDEN'S METHOD WITH $x^0 = \begin{pmatrix} 0 \\ \epsilon \end{pmatrix}$ AND

$$B^0 = \begin{pmatrix} 1+\delta & 0 \\ 0 & 1 \end{pmatrix}.$$

COMPUTE $F'(x)$. SHOW THAT THE (1,1) ELEMENT OF B^k (IN BROYDEN'S METHOD) IS ALWAYS $(1+\delta)$ AND THUS $\{B^k\}$ DOES NOT CONVERGE TO $F'(x^*)$. COMPUTE THE BROYDEN ITERATES x^0 THROUGH x^5 . DISCUSS THE CONVERGENCE OF THESE ITERATES TO x^* . [HERE $F(x^*) = 0$].