ALGORITHM 2.1.

newton$(\mathbf{F}, \mathbf{x}, \tau_a, \tau_r)$

Evaluate $\mathbf{F}(\mathbf{x})$; $\tau \leftarrow \tau_r \|\mathbf{F}(\mathbf{x})\| + \tau_a$.

while $\|\mathbf{F}(\mathbf{x})\| > \tau$ **do**

Compute $\mathbf{F}'(\mathbf{x})$; factor $\mathbf{F}'(\mathbf{x}) = \mathbf{LU}$.

if the factorization fails **then**

report an error and terminate

else

solve $\mathbf{LUd} = -\mathbf{F}(\mathbf{x})$

end if

Find a step length λ using a polynomial model.

$\mathbf{x} \leftarrow \mathbf{x} + \lambda \mathbf{d}$

Evaluate $\mathbf{F}(\mathbf{x})$.

end while