# A complete Newton solver using `Eigen`

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# Newton solver

This example (a simplified version of `Examples/src/NewtonSolver`) is about a set of tools that implement generic Newton or quasi-Newton methods to determine the zero of a system of non-linear equations, based on the `Eigen` library.
The code structure is the following:

- `NewtonTraits` contains the definition of the types used by the main classes, to guarantee uniformity.
- `JacobianBase` is a base class which implements the action of a *quasi-Jacobian*: the user may choose among `FullJacobian` where the actual Jacobian (or an approximation of it) must be specified by the user, and `DiscreteJacobian`, that approximates the Jacobian via finite differences.
- `JacobianFactory` instantiates a concrete derived class of `JacobianBase` family on the fly.
- `Newton` applies the Newton method, given the non-linear system and a `JacobianBase`.
- `NewtonOptions` and `NewtonResults` encapsulate the input options and the output results.