MATLAB's `fzero` Function

A Quick Review

fzero

fzero

Root of nonlinear function

Syntax

```
x = fzero(fun,x0)
x = fzero(fun,x0,options)

x = fzero(problem)

[x,fval,exitflag,output] = fzero( __ )
```

Description

`x = fzero(fun,x0)` tries to find a point x where `fun(x) = 0`. This solution is where `fun(x)` changes sign—`fzero` cannot find a root of a function such as x^2.

fzero

fun — Function to solve
function handle | function name

Function to solve, specified as a handle to a scalar-valued function or the name of such a function. `fun` accepts a scalar `x` and returns a scalar `fun(x)`.

`fzero` solves `fun(x) = 0`. To solve an equation `fun(x) = c(x)`, instead solve `fun2(x) = fun(x) - c(x) = 0`.

To include extra parameters in your function, see the example Root of Function with Extra Parameter and the section Parameterizing Functions.

Example: `'sin'`

Example: `@myFunction`

Example: `@(x)(x-a)^5 - 3*x + a - 1`

fzero

Initial value, specified as a real scalar or a 2-element real vector.

- Scalar — fzero begins at x0 and tries to locate a point x1 where fun(x1) has the opposite sign of fun(x0). Then fzero iteratively shrinks the interval where fun changes sign to reach a solution.
- 2-element vector — fzero checks that fun(x0(1)) and fun(x0(2)) have opposite signs, and errors if they do not. It then iteratively shrinks the interval where fun changes sign to reach a solution. An interval x0 must be finite; it cannot contain ±Inf.

> **i** **Tip**
>
> Calling fzero with an interval (x0 with two elements) is often faster than calling it with a scalar x0.

Example: 3

Example: [2,17]

Manning Equation

- Manning Equation:

- Find H given $S, B, n,$ and Q.

- Rewrite this in "$f(x) = 0$ form":