

What are MATLAB Functions?

- A MATLAB function is a group of MATLAB statements stored in a plain text file. The statements are executed from top to bottom in the file when the name of the function is typed in the command window.
- Functions perform tasks outside of the command window environment (outside the memory space of the command window).
- Functions exchange data via input and output parameters.
- Functions can call other functions.
- A very large fraction of built-in MATLAB commands are functions.
Example: Enter “`type mean`” at the command prompt.

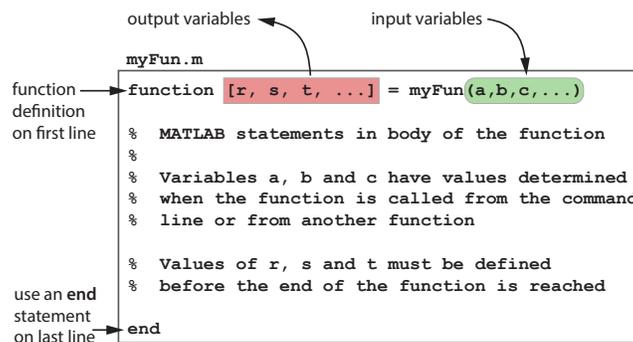
Creating Functions

- Open a new file with the m-file editor.
- Type in statements.
- Save m-file in directory where MATLAB can find it.
- If necessary, change the *current working directory* to the directory containing the m-file or use the `addpath` command to include the path to the file.

Basic Structure of a Function m-file

The schematic at the bottom of the page represents the basic components of an m-file function.

- The name of the function is `myFun` and it is stored in a file called `myFun.m`.
- The first line is the *function definition line*, which must begin with the word `function`.
- The last line of the function should be `end`.
- Put input arguments to the right of the function name and enclose in parenthesis. (...)
- Put output arguments after the `function` keyword, and to the left of the equals sign. Output arguments are enclosed in square brackets. [...]



Basic Rules of Input and Output

The rules for calling functions are simple:

- The number of input arguments and the number of output arguments are defined in the first line of the function.
- To call a function you must supply the correct number of input arguments.
- To call a function you must supply the correct number of output arguments.
- The names of the input and output arguments only matter *inside* a function.

Possible Errors

If your use of function input and output arguments is not working, consider these possibilities:

- The function definition line (the first line) in your function m-file has incorrect syntax, e.g. missing parentheses, missing “function” as first word, missing square brackets around multiple outputs, etc.
- You are not providing the correct number of inputs.
- You are not providing the correct number of outputs in the calling statement.
- You have more than one function in an m-file (that’s OK), but have not included a separate **end** statement at the end of each function.

Examine your code for each of these errors. The items in the preceding list are related to the syntax of defining and calling of functions. They do not deal with the mathematical correctness of your code, or syntax errors in the body of the function.

Practice

Consider these (separate) m-files:

File `foo.m`:

```
function y = foo(x)
    y = sqrt(x);
end
```

File `bar.m`:

```
function y = bar(x)
    y = x^2;
end
```

File `bang.m`:

```
function [r,s,t] = bang(x)
    r = foo(x) + bar(x);
    s = foo(bar(x));
    t = bar(foo(x));
end
```

File `bust.m`:

```
function f = bust(x)
    [a,b,c] = bang(x);
    f = a/b + c;
end
```

Copy and paste these short functions into separate mfiles and experiment with the code. Make sure that the *name* of the m-file is the same as the name of the function, i.e., the code for **function y = foo(x)** is stored in `foo.m`.

For example, try `bust(2)` or `[x,y,z] = bang(5)`. Prove to yourself that you understand the results by manually evaluating the results. Make sure that you can get the same results with pencil and paper that MATLAB gives you.