Week 8: Procedural Abstraction
Writing and Using functions

Reading:

Text book p. 101-113, 193-207, 341-346
I will provide minimal additional notes

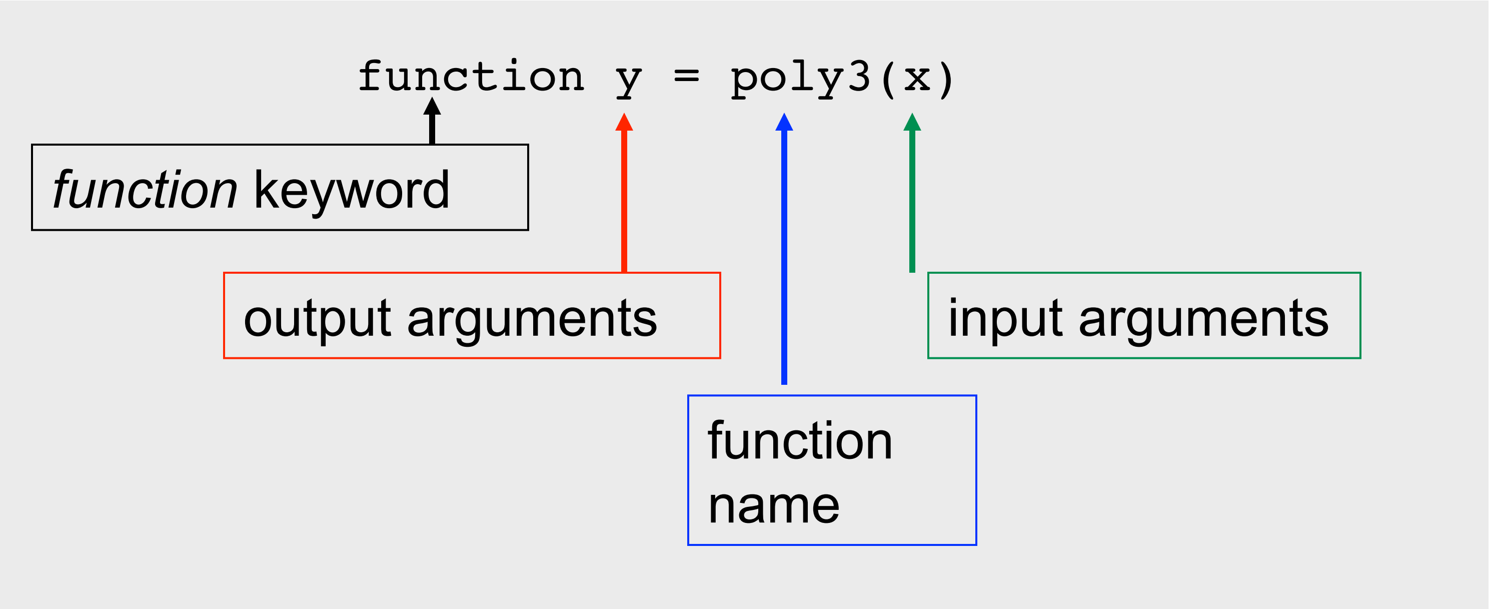
Concepts for Today’s Class:

- defining functions
- using a function
  calling a function, returning from a function, help
- pass-by-value versus pass-by-reference
- scope & sub-functions

Lab: writing a function

Assignment: Part 2 due Wed. Nov 7th, 4pm.

Function Definition Line



```
function y = poly3(x)
```

function keyword

output arguments

function name

input arguments

Can have more than one input argument and/or output argument, e.g.

```
function [volsum, gvadep]=getvol(mlong,mlatg,deg2km,mthick,mask)
```

Matching the order of multiple input/output arguments is critical when calling the function from the main script

H1 Lines and Help

```
function y = poly3(x)
%
% Evaluates a cubic polynomial y = a*x + b*x^2 + c*x^3
% where a=1, b=-1, c=2
%
% Input:    x
% Output:   y = a*x + b*x^2 + c*x^3
%

a = 1;
etc
```

The H1 Lines are the comment block immediately after function definition line, before first line of the code.

They should explain what the function does, the input and output arguments and any checks that are performed.

They appear in the command window when you type e.g.,

```
>> help poly3
```

Function Body

```
function y = poly3(x)
%
% Evaluates a cubic polynomial y = a*x + b*x^2 + c*x^3
% where a=1, b=-1, c=2
%
% Input:     x
% Output:    y = a*x + b*x^2 + c*x^3
%

a = 1;
b = -1;
c = 2;

y = a*x + b*x^2 + c*x^3;

end
```

a, b, c, x, y are *local* variables

Worksheet 1
Exercise 1

Function Call from Main Script

```
t=12;
a = poly3(t)
```

Example 2: our example from earlier for the following function

```
function [volsum, gvadep]=getvol(mlong,mlatg,deg2km,mthick,mask)
```

Function call from main script could look like:

```
[vol1, dep1]=getvol(lon,lat,d2km,mthick,mask)
```

Note that the variables in the main script can have either the same (mthick, mask) OR different (e.g., vol1, dep1, lon, lat,d2km) names from inside the function. This brings us to the topic of how arguments are passed from the script to a function….

Worksheet 1
Exercise 2

Returning from a Function

A function returns control to the main script when the first of the following occur:

1. The end of the code is reached
2. The word “return” is reached
3. The word “error” is reached

Worksheet 1
Exercise 3

Subfunctions

- Subfunctions are a method to further simplify your code
- They are limited in scope i.e. can only be called by the parent function (main function) that contains them

```
function fancyprint(Str)
%
% Print the string Str with * at the beginning and end of
% the string.
%
WrappedStr = wrapstr(Str);
disp(WrappedStr);

function Newstr = wrapstr(Str)

Newstr(1) = '*';
Newstr(2:length(Str)+1) = Str;
Newstr(end+1) = '*';
```

Worksheet 1
Exercises 4, 5 and 6

Logical Indexing:
Prep for worksheet 2 on Thurs

Recall: mentioned during

- week 03
- when logical operators covered
- when “find” covered

Review:

```
x=10*rand(1000,1);

% pick out only values > 5
y2=x(x>5);

% could also have used “find”, but logical indexing is much faster
ix=find(x>5);
y2=x(ix);
```