Functions in Matlab

ChEn 1703

Functions

Why a function?

- Encapsulate functionality
- Reusable - no need to copy/paste code everywhere.

Variable Scope

- Variables inside a function are entirely separate from those outside of the function. Function arguments and outputs are the only tie to outside of the function.

Function ingredients

- input arguments
- output arguments

Function naming, file naming...

Basic MATLAB Function Syntax

$$\text{function } [r_1,...r_n] = \text{funcName}(arg_1,...arg_m)$$
$$\text{function } r = \text{funcName}(arg1,...arg_m)$$

```
function c = silly(a,b)
a = 2*a; % changes local copy of a
c = b+a; % defines result
```

```
disp( silly(2,3) )
```

```
x = 5;
y = x^2;
z = silly(x,y);
```

```
x = 1:2:7;
y = x-1;
z = silly(y,x);
```

- 📌 **Input** arguments:
  - Pass them to the function when you call it
    - ‣ `y=sin(x);   a=linspace(0,10,5);`
  - Can be scalars, arrays, or strings.
  - Order is important.
- 📌 **Output** argument(s):
  - The function calculates them and returns them to you
    - ‣ `y=sin(x);`
    - ‣ `[nr,nc]=size(A);`
  - *Order* is important.
- 📌 **Function name**:
  - Identifies the function.
  - Save the function in its own m-file with the same name as the function name.

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Example - Angle Conversion

Write a MATLAB code to convert from degrees to radians. The user should enter the starting and ending points in the table (in degrees), as well as the number of entries desired. The code should then generate the table and write the results to the screen.

$$\theta_{\text{degrees}} = \frac{180}{\pi}\theta_{\text{radians}}$$

How would we best use a function here?

- Define the algorithm.
- Which pieces can be easily separated?
- Which pieces might we want to re-use?

Documenting Functions

Displays when you type "help linspace"

```
function y = linspace(d1, d2, n)
%LINSPACE Linearly spaced vector.
%   LINSPACE(X1, X2) generates a row vector of 100 linearly
%   equally spaced points between X1 and X2.
%
%   LINSPACE(X1, X2, N) generates N points between X1 and X2.
%   For N < 2, LINSPACE returns X2.
%
%   Class support for inputs X1,X2:
%      float: double, single
%
%   See also LOGSPACE, :.

%   Copyright 1984-2004 The MathWorks, Inc.
%   $Revision: 5.12.4.1 $  $Date: 2004/07/05 17:01:20 $
```

General "rules"

- Document ALL input and output arguments.
- Provide an example of how to use the function.
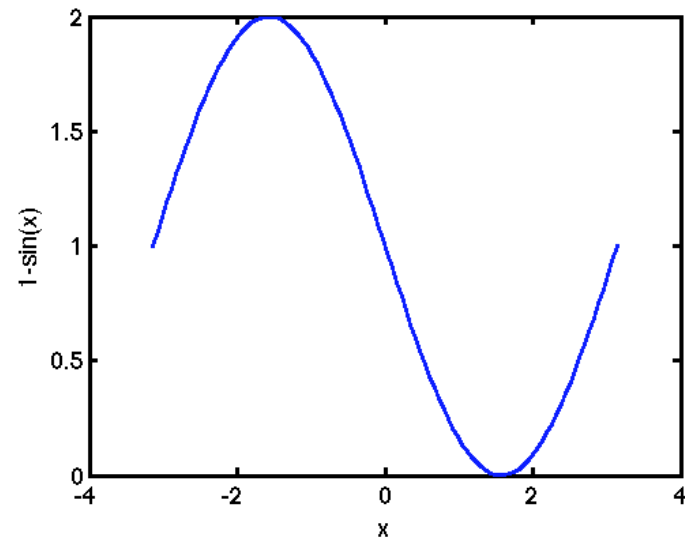
Anonymous Functions

Use an anonymous function for very simple cases.

$$y = 1 - \sin(x)$$

```
clear; clc;

mySinFun = @(x) (1-sin(x));

x = linspace(-pi,pi);
plot(x,mySinFun(x))
```

Name for the "anonymous" function

Indicates the argument for the function (x)

More later...