Lecture 2: Functions

Math 98

Agenda

- Agenda
  - Coursera Videos on Function Basics
  - Exercises
  - Anonymous Functions

Coursera Function Videos

- Writing Simple Functions
  - Multiple Inputs and Outputs
  - How to call the functions
- Separate Workspaces
  - "What happens in the function stays in the function"
- Subfunctions

Example: `myfun.m`

Write a function of the form

```
function [sum, diff, prod] = myfun(a, b)
```

that takes in two numbers a, b and returns their sum, difference, and product. Run each of the following lines and understand the result.

```
>> myfun(3, 4)
>> sum = myfun(3, 4)
>> prod = myfun(3, 4)
>> sum = myfun(3)
>> price = 5; units = 4; [~, ~, rev] = myfun(price, units)
```

Example: `sumrowcols.m`

Write a function of the form

```
function [colsum, rowsum] = sumrowcols(A)
```

that takes in a matrix $m \times n$ matrix A and returns vectors `colsum` and `rowsum` of the column sums and row sums of A, respectively.

Example: `checkerboard.m`

Write a function of the form

```
function A = checkerboard(n, m)
```

that takes two positive integers `n` and `m` as inputs and returns a matrix `A` such that every element of the $n \times m$ output matrix for which the sum of its indices is even is 1. All other entries are zero.

Here is a sample output.

```
>> checkerboard(4, 5)
>> ans =
>> 1 0 1 0 1
>> 0 1 0 1 0
>> 1 0 1 0 1
>> 0 1 0 1 0
```

Function Handles

A function handle is a Matlab variable that allows us to reference functions indirectly. Use them to include functions as inputs to or outputs from other functions.

```
>> integral(cos,0,1)
Error using cos
Not enough input arguments.
>> integral(@cos,0,1)
    0.8415
```

Anonymous Functions

A way to define functions in the middle of a Matlab script or in the command line. Takes the form `functionName = @(inputs)(output)`, and returns the function handle `functionName`.

```
>> f = @(x,y)(x^2-y);
>> f(10, 3)
    97
>> fzero( @(x)(x^2-2), 1.5)
    1.4142
```

Useful when defining functions with simple expressions.

Anonymous Functions

Here are some more functions:

```
>> b = 3; c = 5;
>> f1 = @(x)(x^3 + b*x + c);
>> fzero(f1,0)
    -1.1542
>> b = 2; c = -1;
>> f2 = @(x)(x^3 + b*x + c);
>> fzero(f2, 0)
    0.4534
```

Question: does changing the values of `b` and `c` change the function `f1`, or will `f1` and `f2` be different functions?