Anonymous Functions and `fplot()`

ME 2004

Anonymous Functions

- Anonymous Function: simple, one-line function
  - Most practical use: simple math expression ($y = \cos(x)$, etc.)
  - Can have multiple inputs but only 1 output
  - Does not have to be stored in a standalone .m file

```
functionHandle = @(input1,input2…) equation
```

  - `functionHandle`: MATLAB object storing the anonymous function
  - `input1,input2`: input arguments
  - `equation`: the expression to be evaluated

Anonymous Functions

- Example:

```
kmh_to_mps = @(v_kmh) v_kmh*(1000/3600)
```

- Calling the function:

```
v_kmh = 80;
v_mps = kmh_to_mps(v_kmh)

aksxjkmlsddlasmkx = 80;
v_mps = kmh_to_mps(aksxjkmlsddlasmkx)
```

fplot()

- fplot(): plots an anonymous function given upper/lower limits
  - An easier way of generating plots of anonymous functions than by using plot()

```
fplot(functionHandle,[xmin xmax])
```

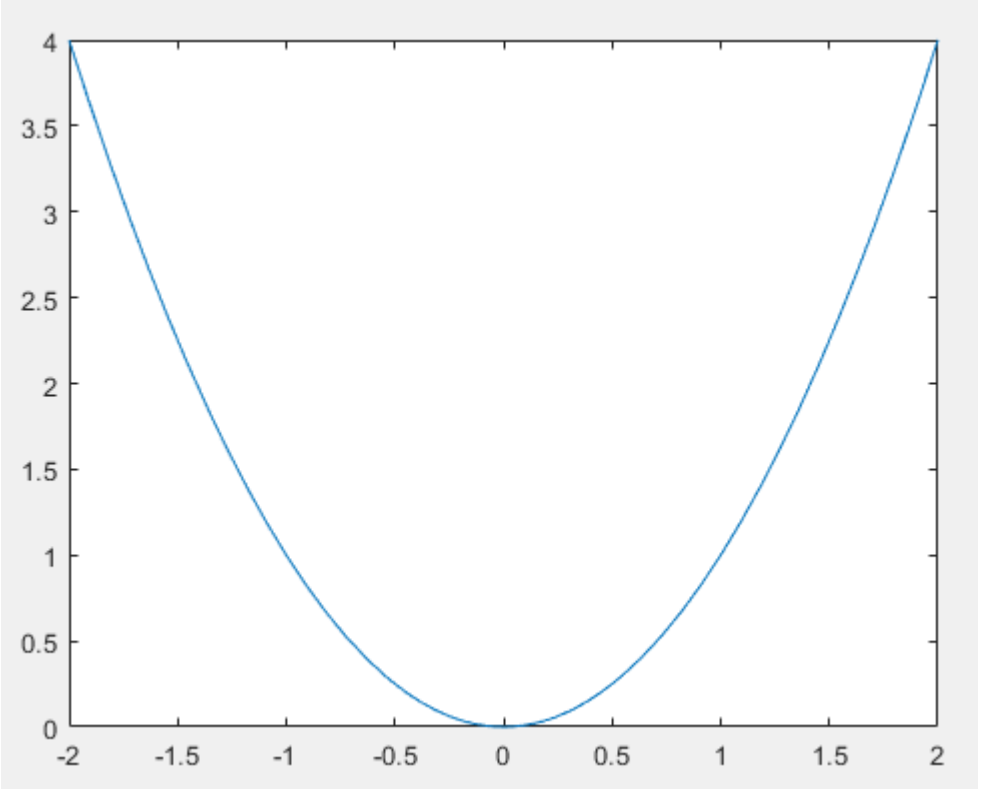
  - functionHandle: MATLAB object storing the anonymous function
  - xmin: lower x-axis limit of the plot
  - xmax: upper x-axis limit of the plot
  - Can specify linewidth, colors, etc. just like plot()

fplot()

- **Example:**

```
my_square = @(x) x.^2;
fplot(my_square,[-2 2])

fplot(@(x) x.^2,[-2 2])
```

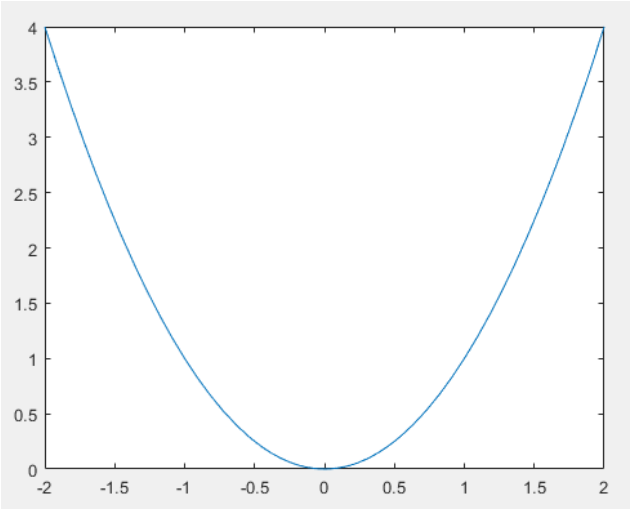


fplot()

- Don’t neglect dot notation!

Command Window

```
>> my_square = @(x) x^2;
>> fplot(my_square,[-2 2])
Warning: Function behaves unexpectedly on array inputs. To improve performance, properly vectorize your function to return an output with the
same size and shape as the input arguments.
> In matlab.graphics.function.FunctionLine>getFunction
In matlab.graphics.function/FunctionLine/updateFunction
In matlab.graphics.function/FunctionLine/set.Function_I
In matlab.graphics.function/FunctionLine/set.Function
In matlab.graphics.function.FunctionLine
In fplot>singleFplot (line 245)
In fplot>@(f)singleFplot(cax,{f},limits,extraOpts,args) (line 200)
In fplot>vectorizeFplot (line 200)
In fplot (line 166)
fx >>
```



Anonymous Functions Comparison

Criterion	Anonymous Function	User-Defined Functions
# Inputs	∞	∞
# Outputs	1	∞
Use Case	Simple math equations	Are typically used to write decently complex code
Complementary Plot Command	fplot()	N/A
Storage	Function Handle within the script	At the end of a script file, or as a standalone .m file

Anonymous Functions Utility

- Other notable MATLAB functions which use and/or require anonymous functions:
  - `fzero()`
  - `integral()`, `integral2()`, `integral3()`
  - `ode45()`, `ode23s()`, etc.

  - `fplot3()`
  - `fmincon()`, `fminsearch()`, etc.