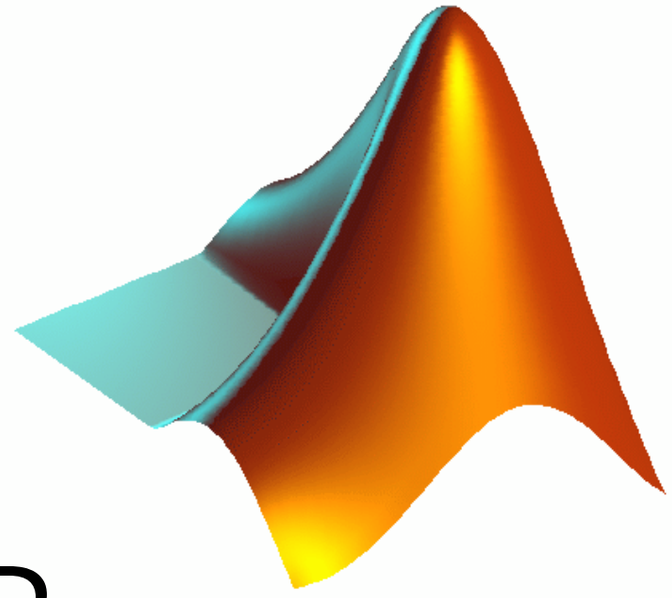


Introduction to MATLAB

Exercises Multiple View Geometry

April 10th, 2014

Why MATLAB?

- Numerical Computing Environment
- Allows Matrix Manipulations
- Plotting of Functions and Data
- Widely used in Academic and Research Institution

MATLAB Student Version

matlab.rbg.tum.de

↓

Login using your MyTUM-Account

Matrices and Vectors

```
        zeros                    [1,2;3,4;5,-6]
eye
                                 [1,2,3;4,5,-6]
        ones
                        A = [1 2 3;4 5 -6]
 rand
```

```
[eye(2);ones(2)]                 repmat(A,n,m)

[eye(2) rand(2)]                 A'
```

Useful Commands

`Ctrl+C`

Help browser

`doc`

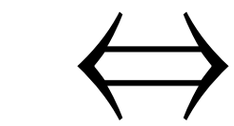
`help`

`clc`

`clear`

`,` `;`

Vectors

```
v = 1:1:10
```

```
v = 1:10
```

```
v = 1:-3:-10
```

```
v = START : STEPSIZE : END
```

```
v = linspace(1,-10,3)
```

```
v = linspace(START , END , nElements)
```

Operators

Element-Wise Operations !!

$$.* \qquad ./ \qquad .\hat{}$$

$$\begin{pmatrix} 1 & 2 & 2 \\ 0 & 2 & 2 \end{pmatrix} .* \begin{pmatrix} 5 & 0 & 2 \\ 0 & 1 & 0 \end{pmatrix} = \begin{pmatrix} 5 & 0 & 4 \\ 0 & 2 & 0 \end{pmatrix}$$

$$\underset{(m \times n)}{A} \quad .* \quad \underset{(m \times n)}{B} \quad = \quad \underset{(m \times n)}{C}$$

Operators

Element-Wise Operations !!

$$.* \qquad ./ \qquad .\hat{}$$

$$\begin{pmatrix}2\\3\\4\end{pmatrix} .* \begin{pmatrix}2\\3\\4\end{pmatrix} \qquad \text{vs.} \qquad (2\ 3\ 4) * \begin{pmatrix}2\\3\\4\end{pmatrix}$$

Element-Wise Operations

$$A = \begin{pmatrix} 1 & 2 & 2 \\ 0 & 2 & 2 \end{pmatrix}$$

$$B = \begin{pmatrix} 5 & 0 \\ 0 & 1 \\ 2 & 0 \end{pmatrix}$$

$$c = (2\ 3\ 4)$$

```
A^2
A + 5
A - 2
A * 5
A / 2
B * A
c * B
A * B
A * c'
```

Element-Wise Operations

$$A = \begin{pmatrix} 1 & 2 & 2 \\ 0 & 2 & 2 \end{pmatrix}$$

$$B = \begin{pmatrix} 5 & 0 \\ 0 & 1 \\ 2 & 0 \end{pmatrix}$$

$$c = (2\ 3\ 4)$$

```
A.^2
A + 5
A - 2
A * 5
A / 2
B * A
c * B
A * B
A * c'
```

Functions

```
sum
min
abs
sin
sort
cos
max
exp
floor
numel
sqrt
log
length
size
x(i)
length(A(:))
A(1,end)
A(i,j)
```

Indexing

```
x = [-3 -2 -1 0 1 2 3]
M = [1 2; 2 1]
A = [1 2; 3 4; 5 6]
B = zeros(3)
```

```
x(2:4)
x([2 3 end end 1])
x(M)
```

```
A(2:end,:)
A(1,:)
A(:,2)
B(2:2:end) = 1
```

Operators

```
&     |     ~
==    ~=
>     <
<=    >=
```

```
A = rand(2)

A<=0.2 | A>=0.8

L = A>0.5

f = find(A>0.5)

A(f)
```

Functions

File name: `funcname.m`

```
function [output_args] = funcname(input_args)
...
end
```

Functions

File name: `funcname.m`

```
function [output_args] = funcname(input_args)
...
```

```
for i = 1:5
   ...
end
```

```
while (i < 5)
   ...
end
```

```
if (...)
   ...
elseif (...)
   ...
else
   ...
end
```

```
end
```

Anonymous Functions and Plots

```
f = @(x) x^2

f(5)
```

```
x = -10:1:10

plot(x,f(x))
```

Anonymous Functions and Plots

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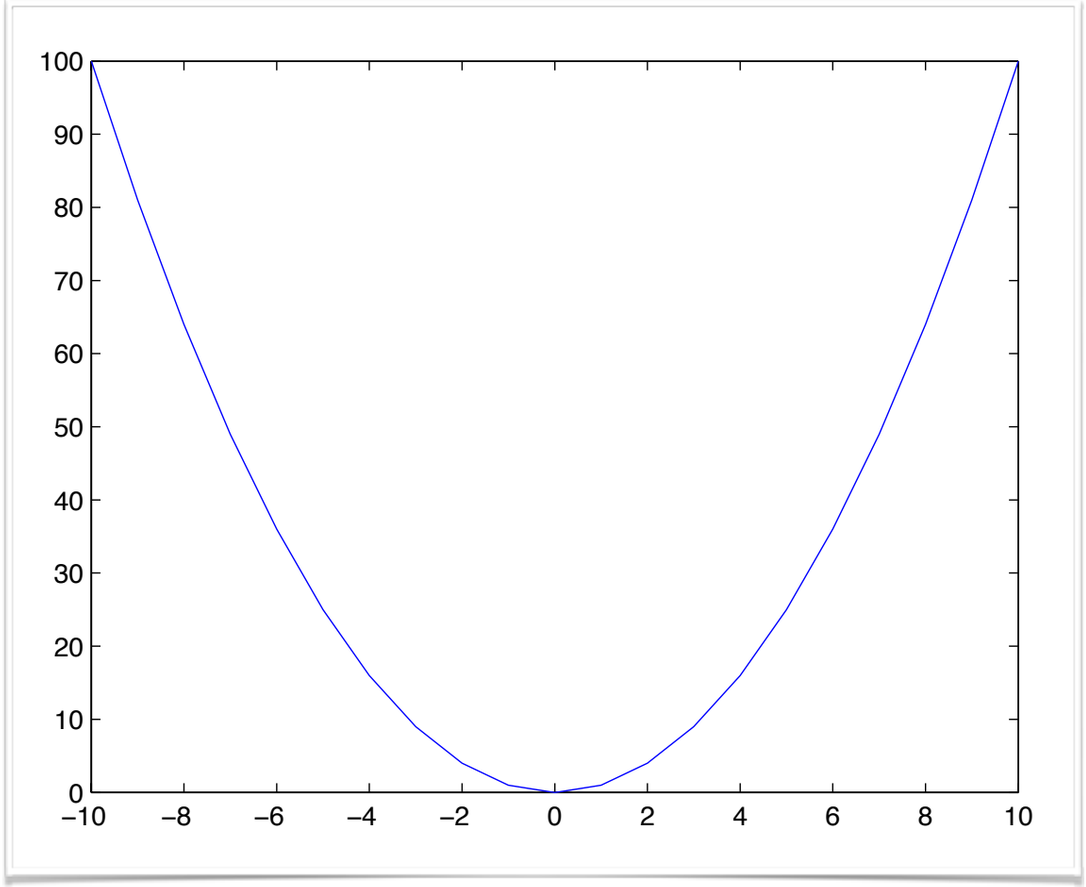
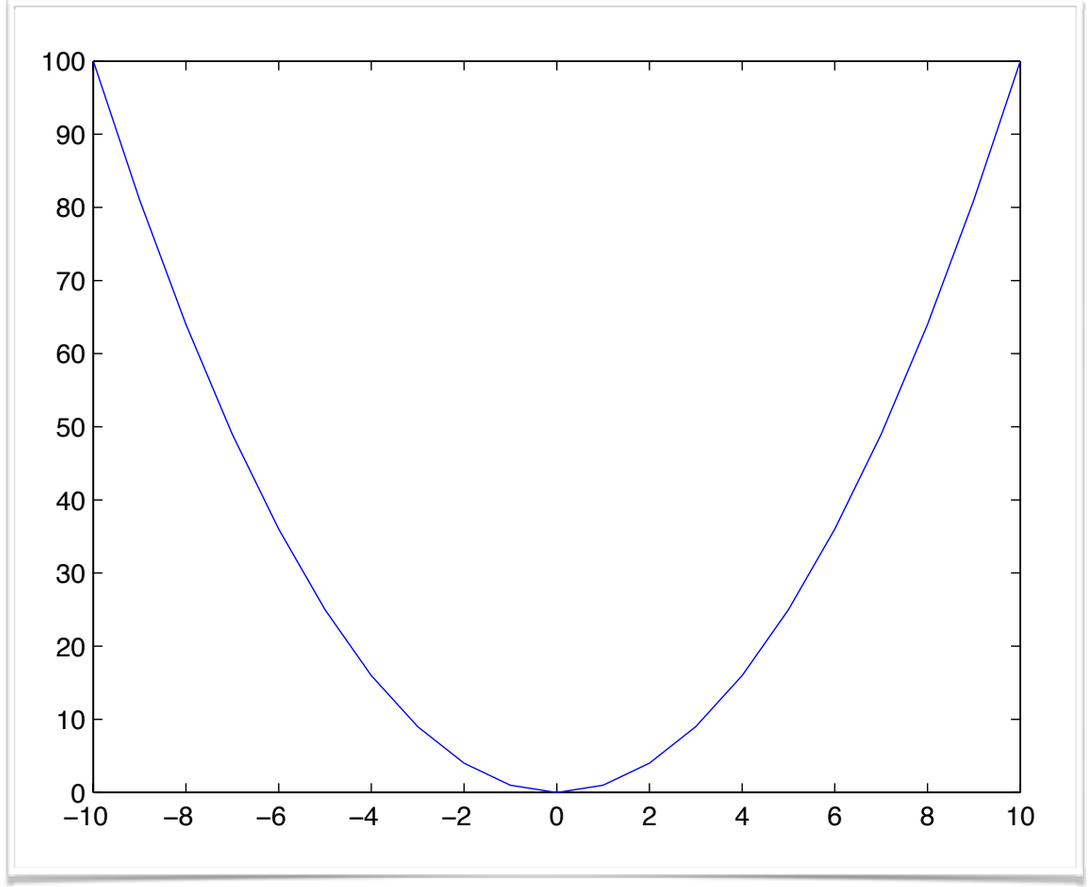


Anonymous Functions and Plots

```
f = @(x) x.^2

f(5)


x = -10:1:10

plot(x,f(x))
```

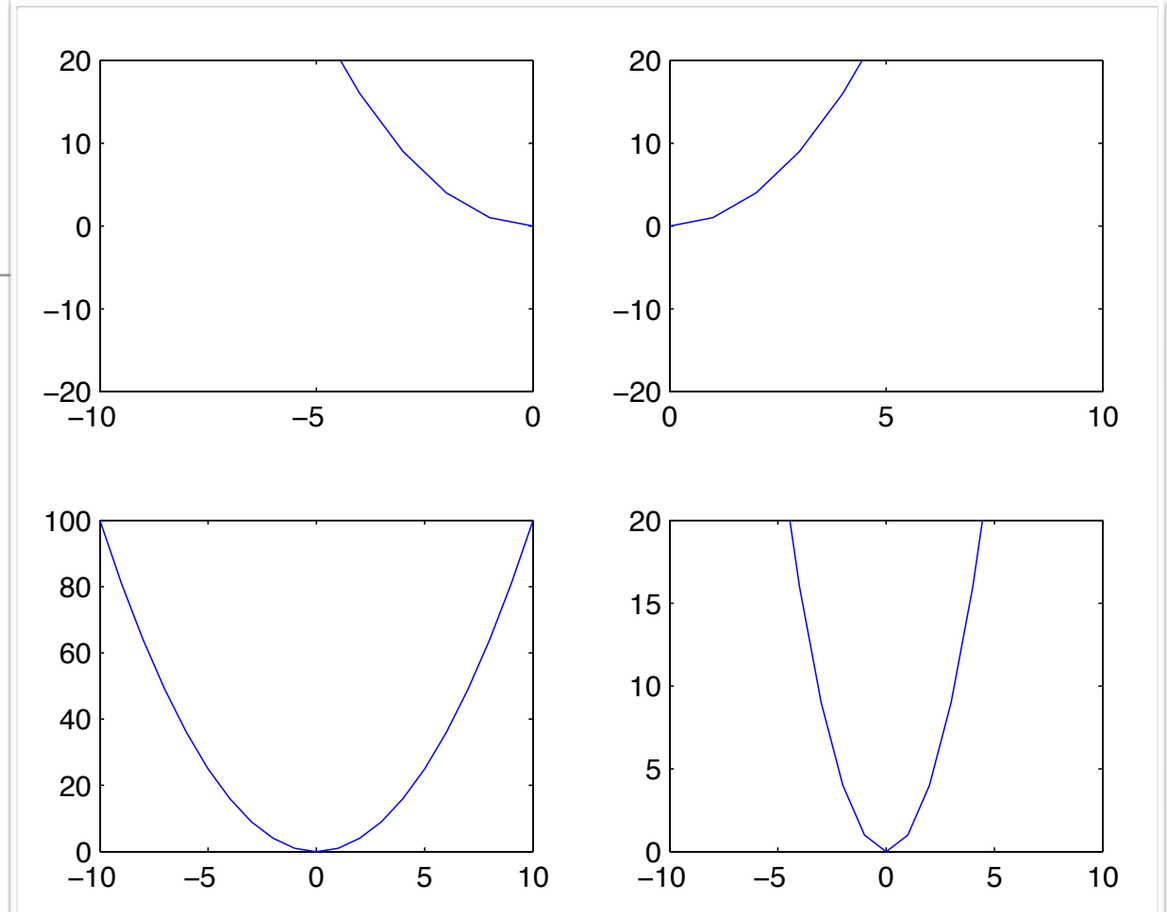
‘r‘ ‘--r‘ ‘-.g‘

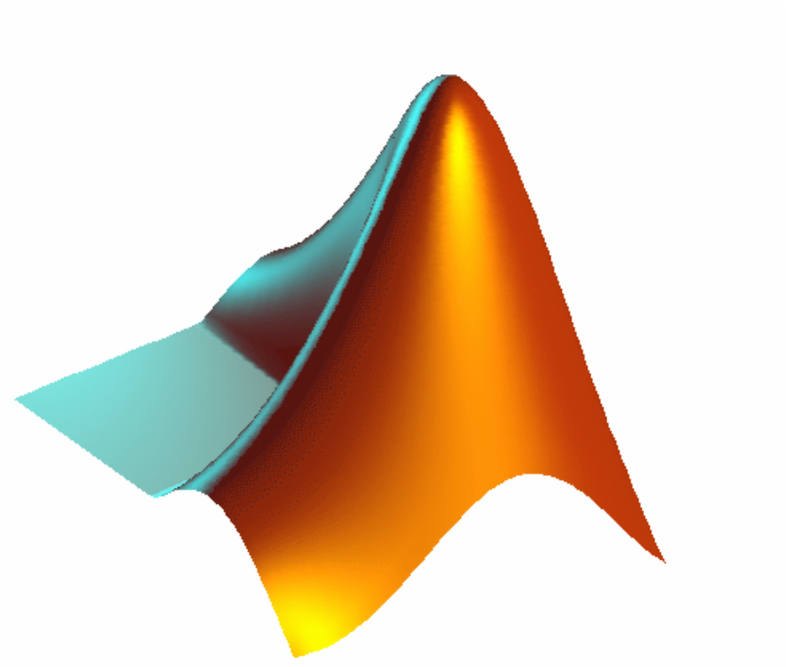



```
axis([xmin xmax ymin ymax])

hold on
```

Subplot

```
figure(1)
hold on

subplot(2,2,1)
plot(..)
axis([xmin xmax ymin ymax])

subplot(2,2,2) , plot(..)
...
```





Questions?

vision.in.tum.de/teaching/ss2014/mvg2014

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MATLAB Kurzhilfe

www-m1.ma.tum.de/foswiki/pub/M1/Lehrstuhl/BorisVonLoesch/matlabCS.pdf

Exercise 1

Write a function `approxequal(x, y, eps)`

comparing two vectors *x* and *y* if they are almost equal, i.e.:

for all indices *i*: $\| x_i - y_i \| \leq eps$

The output should be logical 1 or 0.

If the input consists of two matrices, your function should compare the columns of the matrices if they are almost equal.

In this case, the output should be a vector with logical values 1 or 0.

Exercise 2

Write a function `addprimes(s, e)`

returning the sum of all prime numbers between *s* and *e*.

Use the Matlab-function `isprime`.