Wykład 3
24.03.2025 r.
Wstęp do Matlaba, cz. 2

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Funkcje

Wywoływanie funkcji:

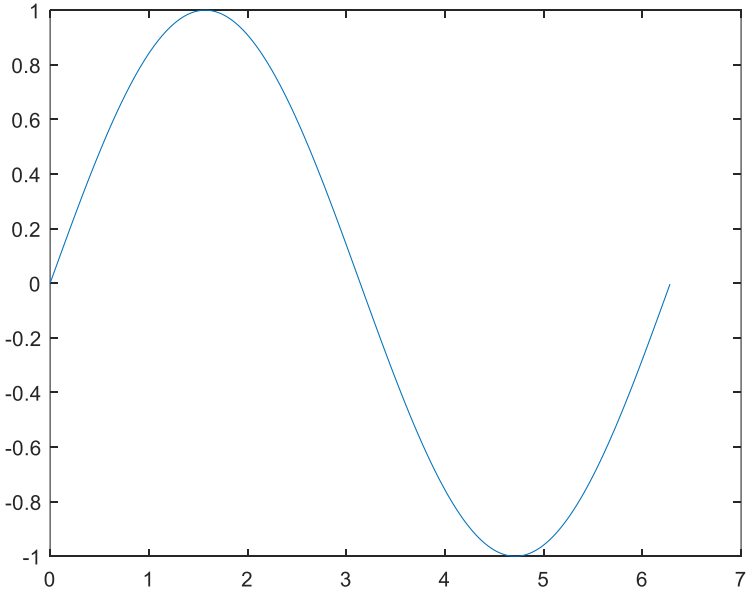
```
>> A = [1 2 3 4];
>> max(A)
ans =
    4
```

Wywoływanie funkcji:

```
A = [1 2 28 4];
>> [maxA,index] = max(A)
maxA =
    28
index =
    3
```

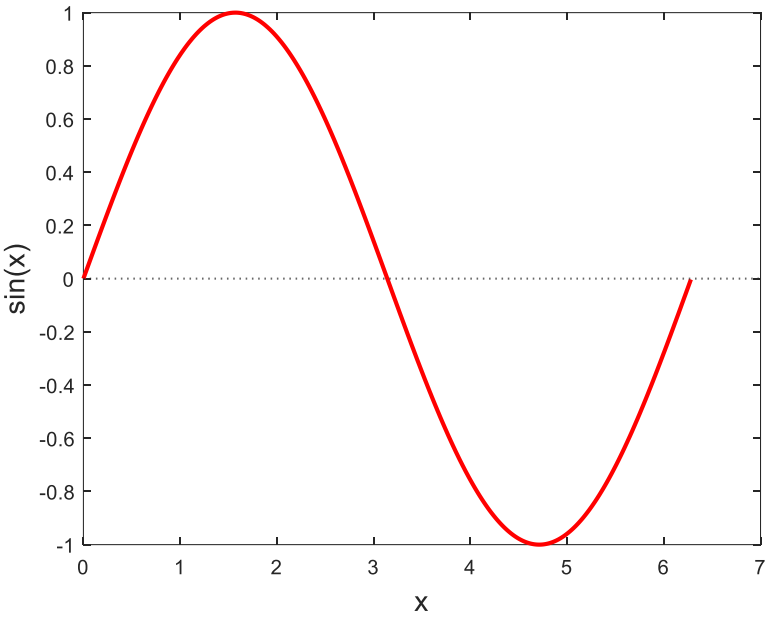
Rysowanie wykresów

```
>> x = 0:0.01:2*pi;
>> y = sin(x);
>> plot(x,y);
```



Rysowanie wykresów

```
x = 0:0.01:2*pi;
y = sin(x);
plot(x,y, '-r', 'Linewidth', 2);
xlabel('x',"FontSize", 14);
ylabel('sin(x)',"FontSize", 14);
yline(0, ':', 'Linewidth', 1);
```



Rysowanie wykresów

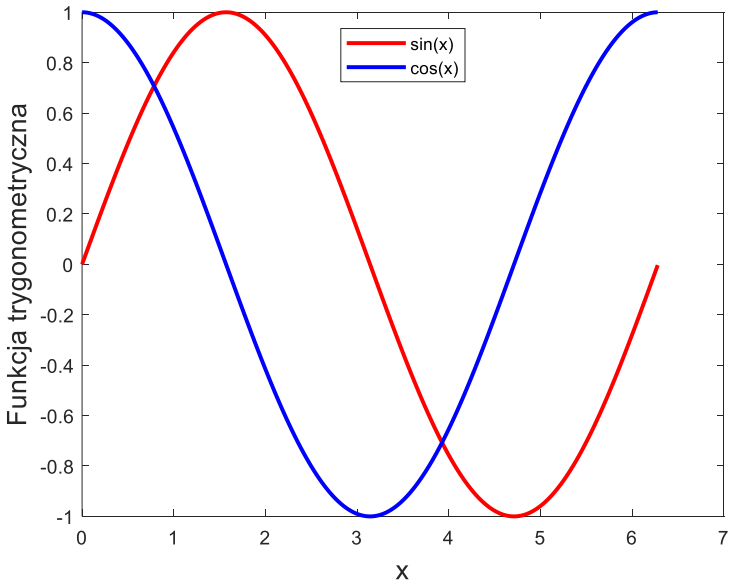
Marker	Description
'o'	Circle
'+'	Plus sign
'*'	Asterisk
'.'	Point
'x'	Cross
'_'	Horizontal line
'|'	Vertical line
's'	Square
'd'	Diamond
'^'	Upward-pointing triangle
'v'	Downward-pointing triangle
'>'	Right-pointing triangle
'<'	Left-pointing triangle
'p'	Pentagram
'h'	Hexagram

Line Style	Description
-	Solid line
--	Dashed line
:	Dotted line
-.	Dash-dot line

Color	Description
y	yellow
m	magenta
c	cyan
r	red
g	green
b	blue
w	white
k	black

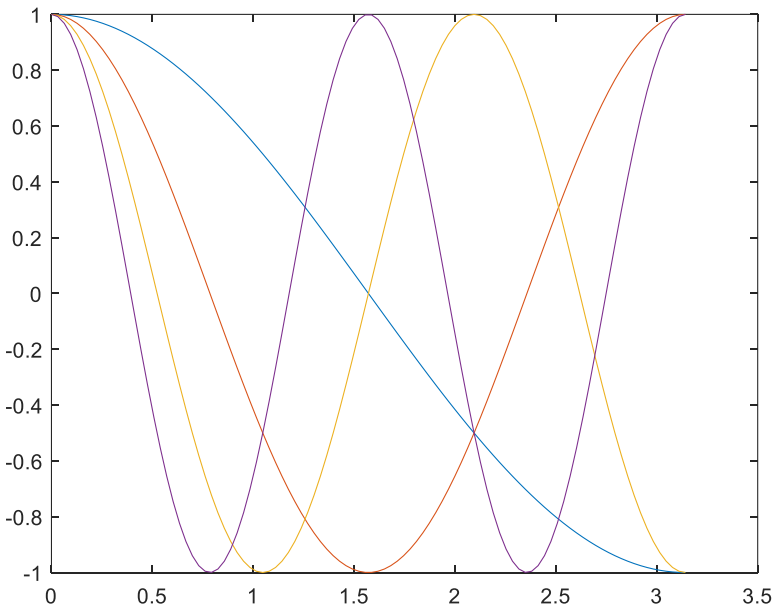
Rysowanie wykresów

```
x = 0:0.01:2*pi;
y1 = sin(x);
y2 = cos(x);
plot(x, y1, '-r', x, y2, '-b', 'Linewidth', 2);
xlabel('x',"FontSize", 14);
ylabel('Funkcja trygonometryczna',"FontSize", 14);
legend('sin(x)','cos(x)', 'Location','north');
```



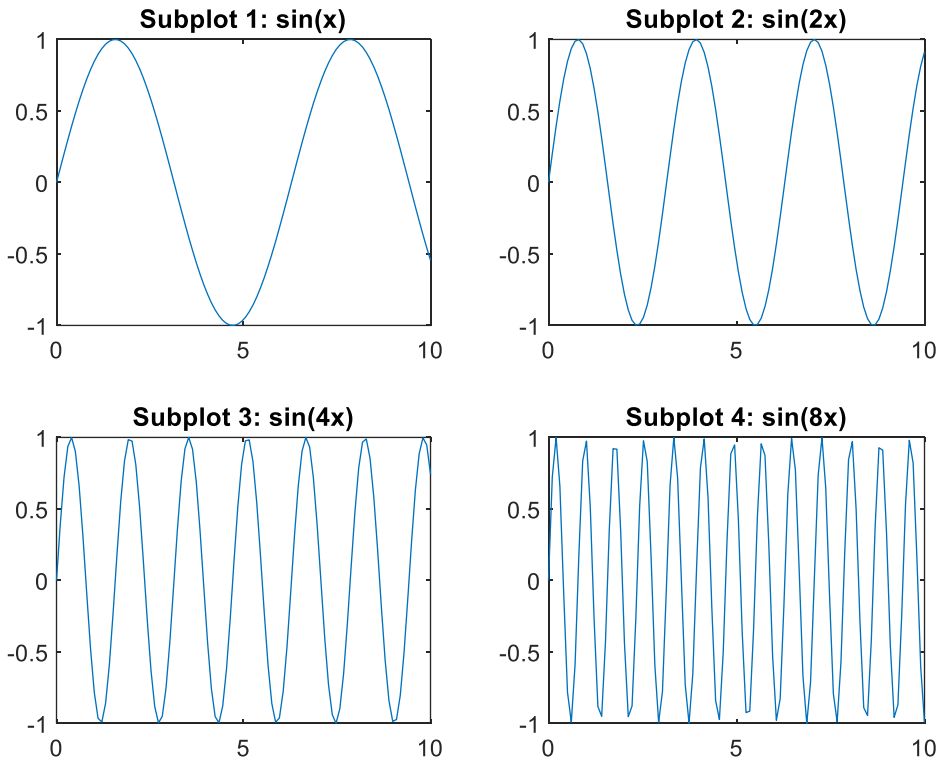
Rysowanie wykresów

```
x = linspace(0,pi);
y1 = cos(x);
plot(x,y1)

hold on
y2 = cos(2*x);
plot(x,y2)

y3 = cos(3*x);
plot(x,y3)

y4 = cos(4*x);
plot(x,y4)
hold off
```



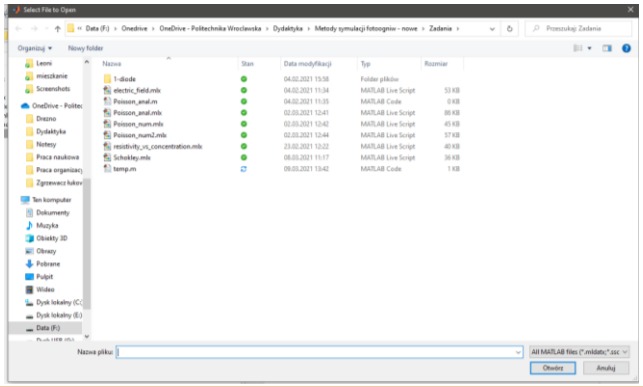
Subplot

```
subplot(2,2,1)
x = linspace(0,10);
y1 = sin(x);
plot(x,y1)
title('Subplot 1: sin(x)')

subplot(2,2,2)
y2 = sin(2*x);
plot(x,y2)
title('Subplot 2: sin(2x)')

subplot(2,2,3)
y3 = sin(4*x);
plot(x,y3)
title('Subplot 3: sin(4x)')

subplot(2,2,4)
y4 = sin(8*x);
plot(x,y4)
title('Subplot 4: sin(8x)')
```

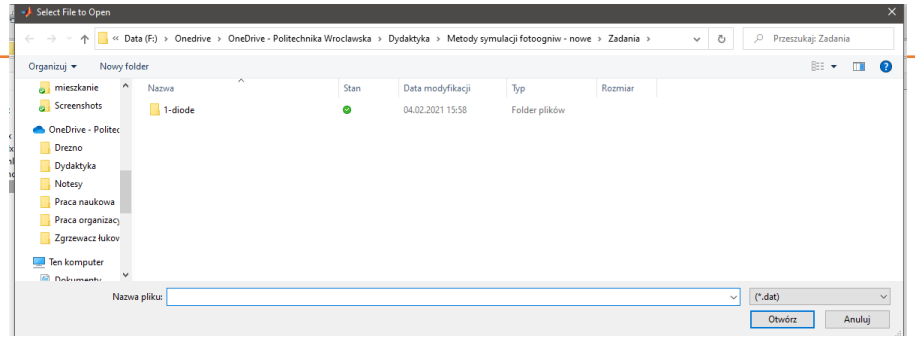


Otwieranie plików

```
[file,path] = uigetfile;
```



```
[file,path] = uigetfile('*.dat');
if file == 0
   disp('User selected Cancel')
else
   disp(['User selected ', fullfile(path, file)])
end
```



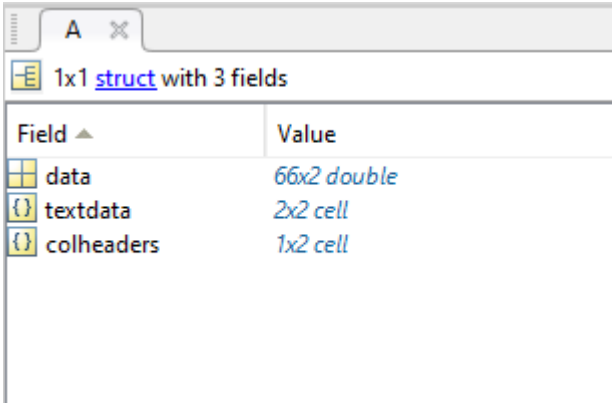
Otwieranie plików

```
n_table= readtable('data.txt');
   n = table2array(n_table);
```

Typ danych table

```
A = importdata('filename',
        delimeter,
  numer_of_header_lines);
```

Typ danych double albo struct




```
Struct:
n = A.data;
```

Cell array

```
a = cell(2,2);
a{1,1} = 2;
a{2,1} = 'char';
a{1,2} = "string";
a{2,2} = [1 2 3 4];
disp(a);
 {[   2]}     {["string"]}
 {'char'}     {1×4 double}
```

```
b = a{1,1};
c = a{2,1};
d = a{1,2};
e = a{2,2};
whos;
```

Name	Size	Bytes	Class
a	2x2	614	cell
b	1x1	8	double
c	1x4	8	char
d	1x1	150	string
e	1x4	32	double

Przewodność

Konduktywność

$$\sigma = \frac{1}{\rho} = q(n\mu_n + p\mu_p)$$

Ruchliwość

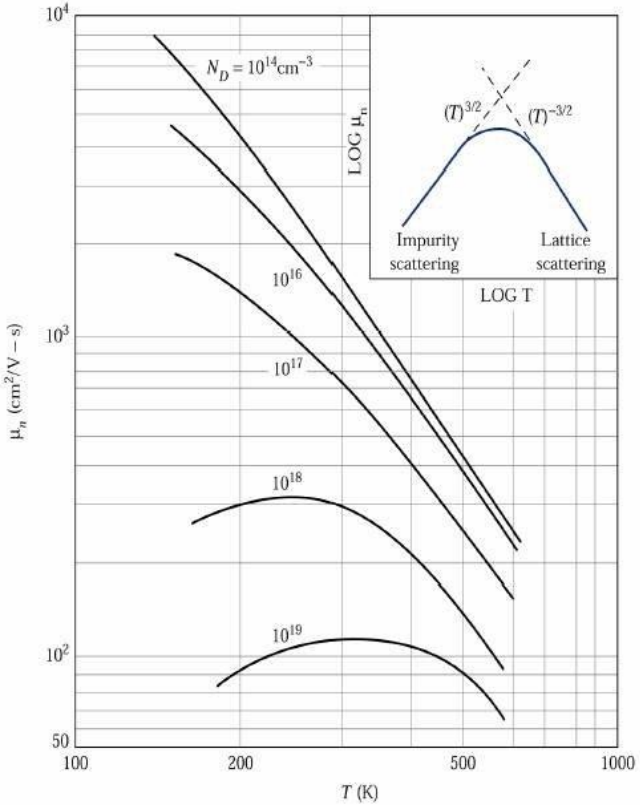
Ruchliwość wyraża związek pomiędzy prędkością dryfu a polem elektrycznym:

$$v_d = \mu E$$

Równanie empiryczne dla krzemu. Stałe materiałowe zależne od materiału i typu domieszki:

$$\mu = \mu_{min} + \frac{\mu_{max} - \mu_{min}}{1 + \left(\frac{N_d}{N_r}\right)^{\alpha}}$$

Ruchliwość vs temperatura

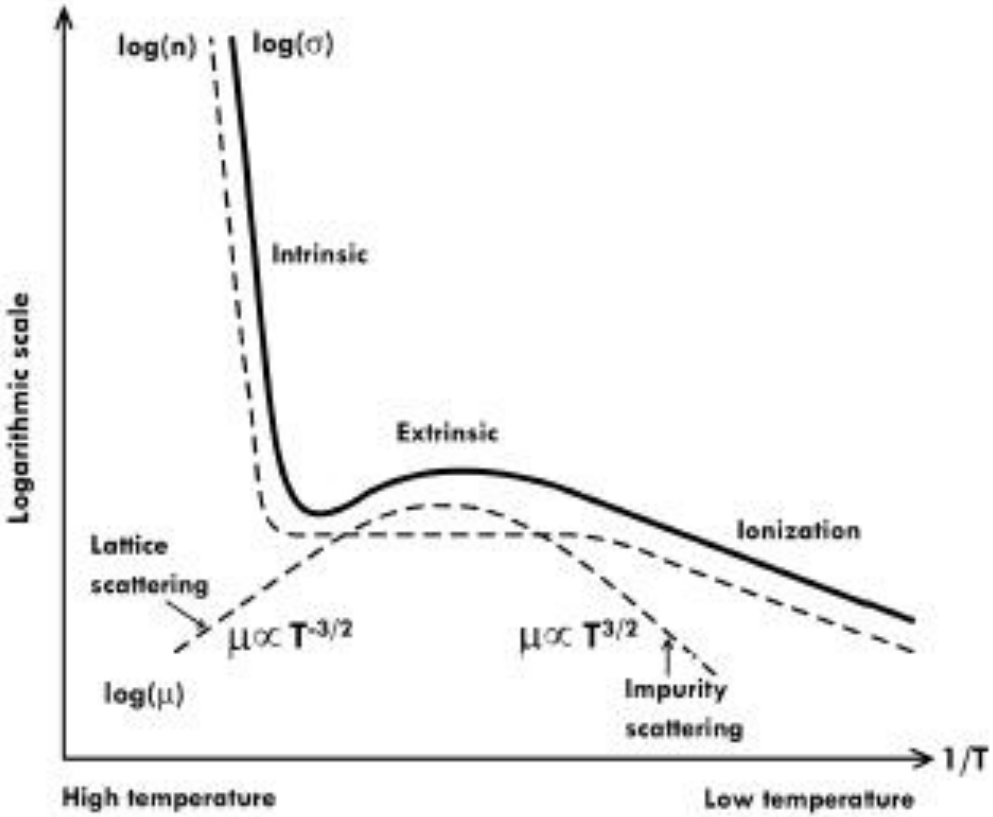


Zasada Matthiessena:

$$\frac{1}{\mu} = \frac{1}{\mu_I} + \frac{1}{\mu_L}$$

Czas pomiędzy kolejnymi rozproszeniami nośnika:

$$\tau_L \propto T^{-\frac{3}{2}}$$

$$\tau_I \propto T^{\frac{3}{2}}$$

Przewodność vs temperatura