








# Графики в MATLAB

## Лекция #2

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# Содержание

-  **Справочная система help graph2d, graph3d и specgraph**
-  **Построение двумерных графиков**
-  **Настройка внешнего вида графиков**
-  **Трёхмерные графики**
-  **Настройка внешнего вида графиков с помощью команд меню**

## Построение простейших 2d графиков

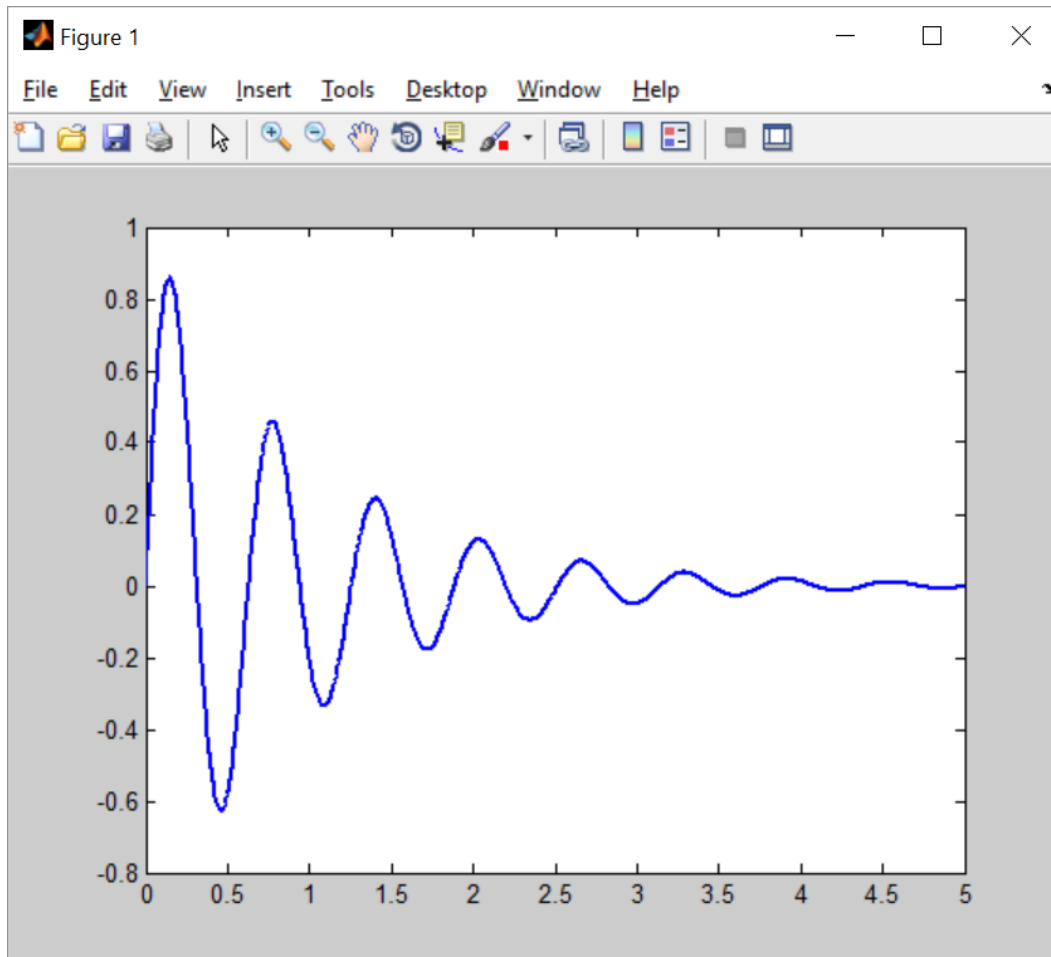
```
>> help graph2d
```

Two dimensional graphs.

### Elementary X-Y graphs.

```
plot      - Linear plot.  
loglog    - Log-log scale plot.  
semilogx  - Semi-log scale plot.  
semilogy  - Semi-log scale plot.  
polar     - Polar coordinate plot.  
plotyy    - Graphs with y tick labels  
           on the left and right.
```

## Построение простейших 2d графиков. **plot**



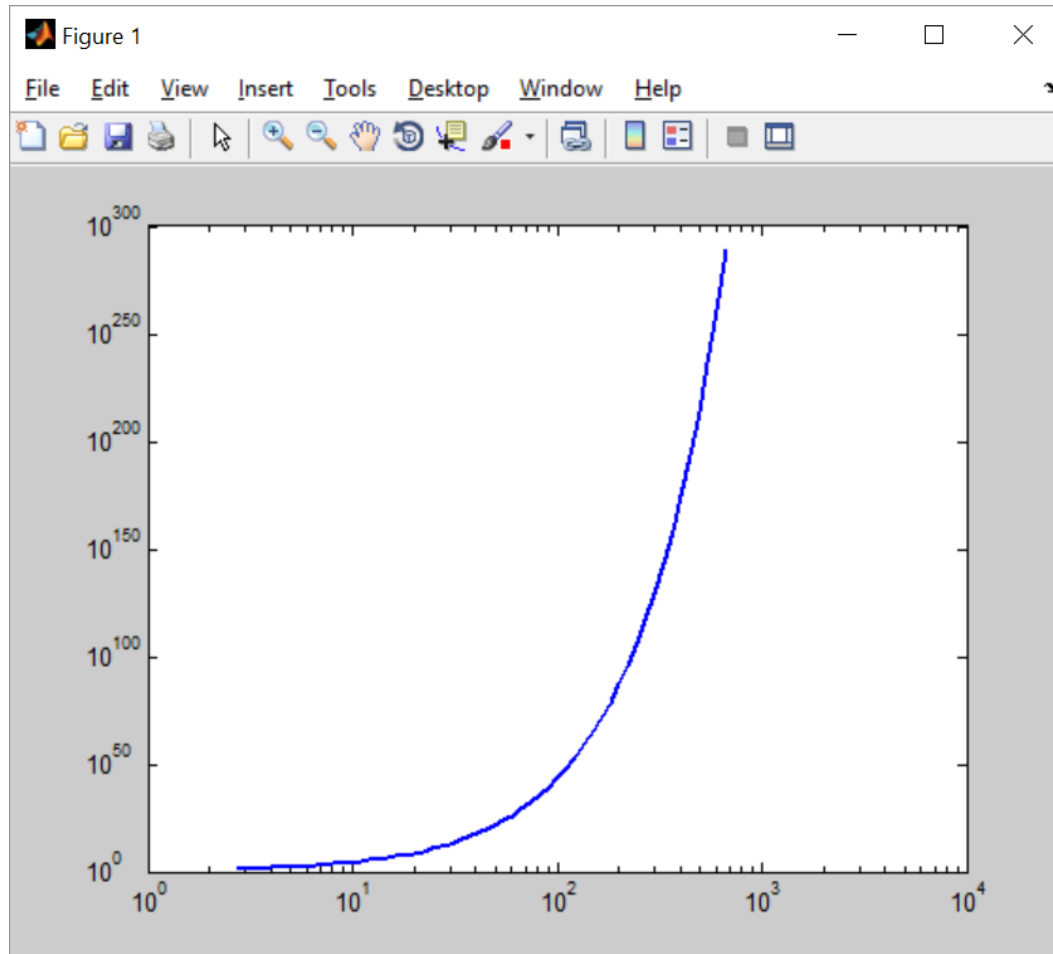
```
x = [0:0.005:5];
```

```
y = exp(-x)...
```

```
    .*sin(10*x);
```

```
plot(x, y)
```

## Построение простейших 2d графиков. **loglog**



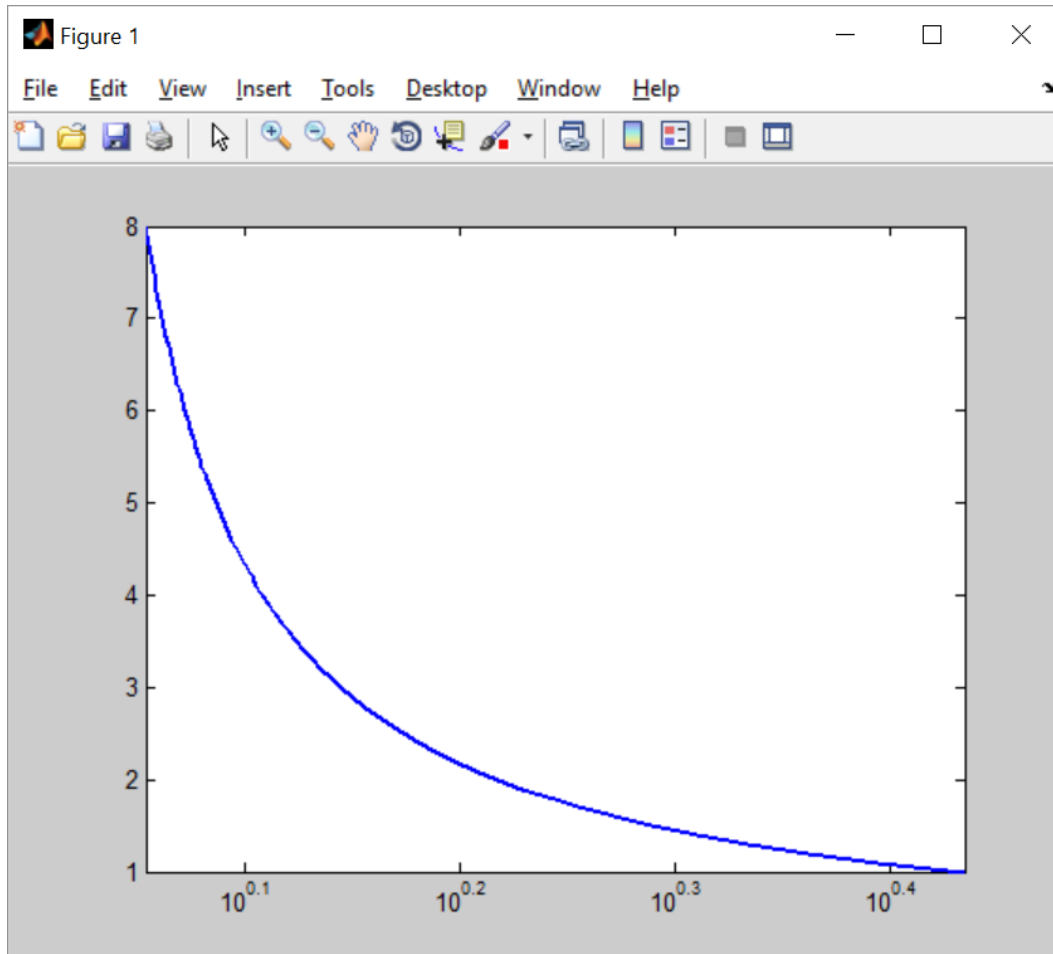
```
q=[1:0.1:8]
```

```
x=exp(q)
```

```
y=exp(x)
```

```
loglog(x,y)
```

## Построение простейших 2d графиков. **semilogx**



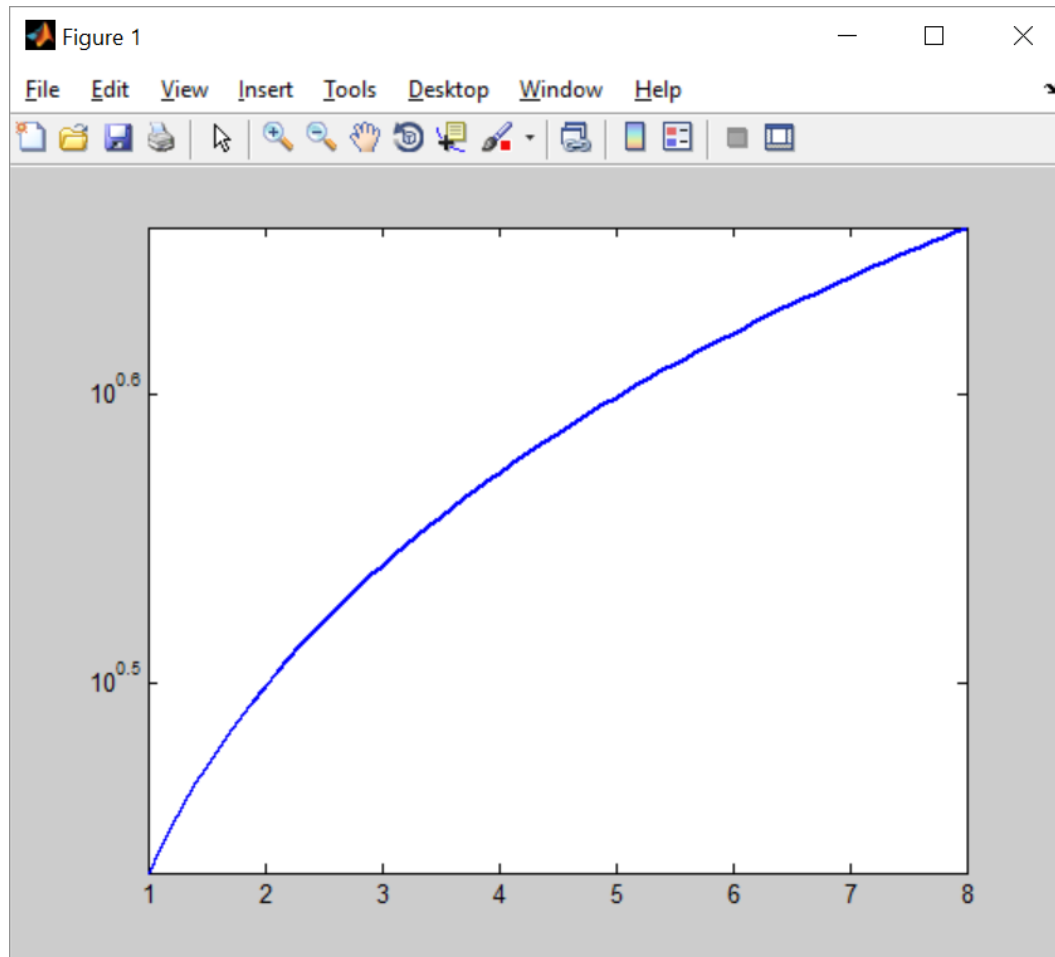
```
q=[1:0.1:8]
```

```
x=exp(1./q)
```

```
y=q
```

```
semilogx(x,y)
```

# Построение простейших 2d графиков. **semilogy**

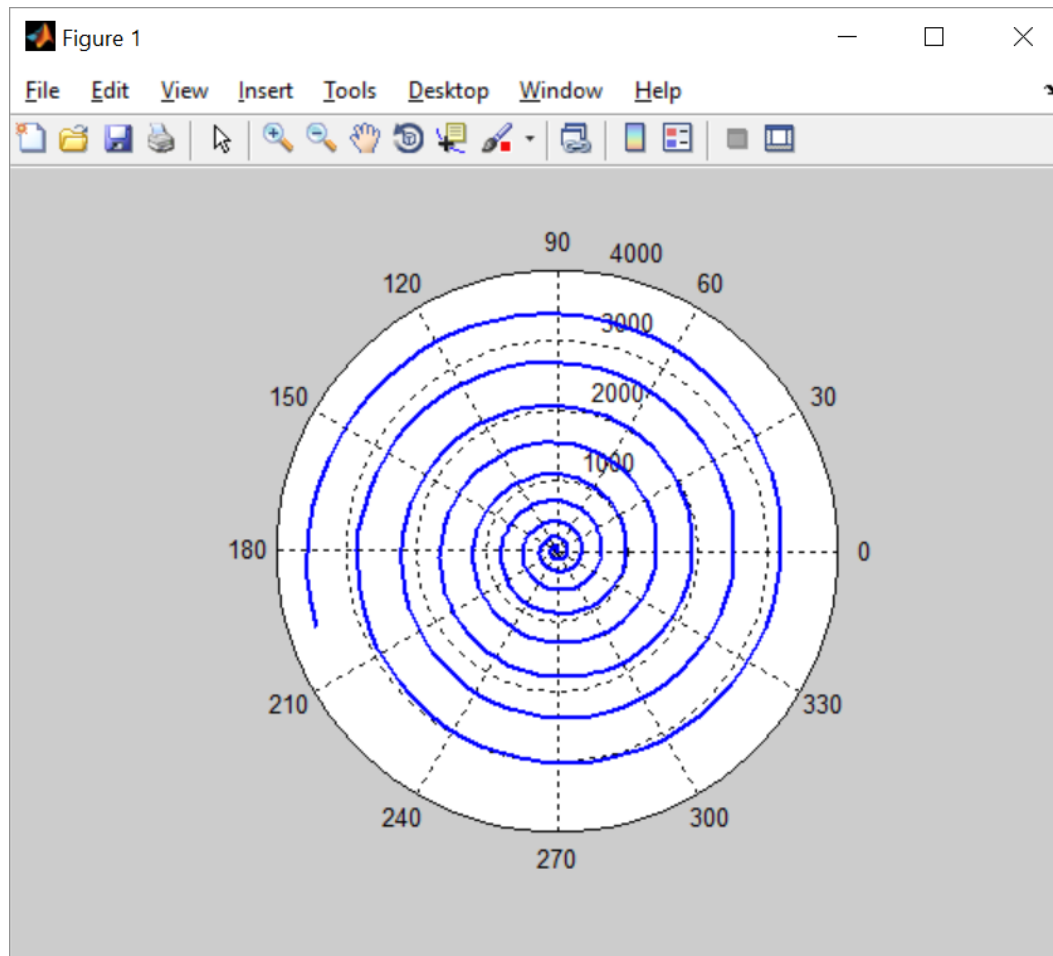


```
x=[1:0.1:8]
```

```
y=exp(x.^(1/5))
```

```
semilogy(x,y)
```

# Построение простейших 2d графиков. **polar**



```
t=0:0.1:60;
```

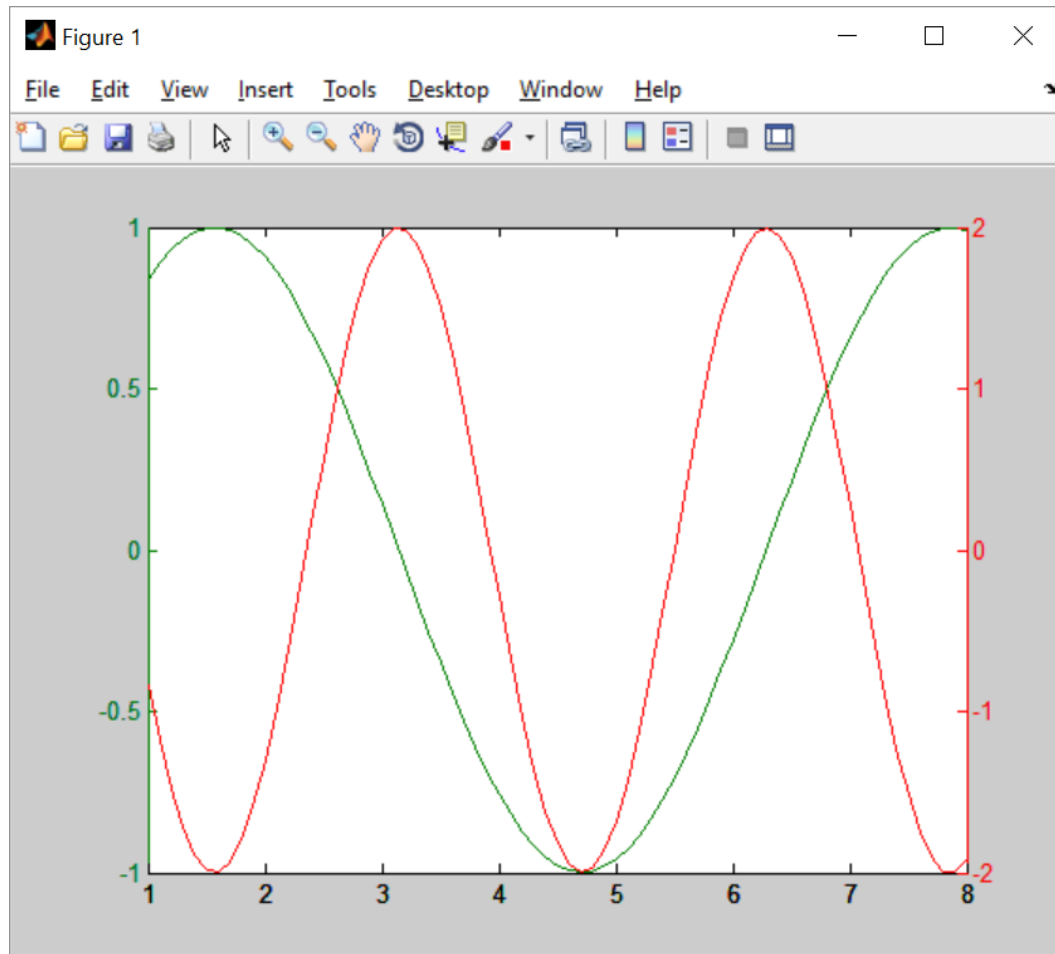
```
r=t.^2;
```

```
p=polar(t,r)
```

```
set(p, 'lineWidth', 2)
```



# Построение простейших 2d графиков. **plotyy**



```
x=[1:0.1:8]
```

```
y1=sin(x)
```

```
y2=2*cos(2*x)
```

```
plotyy(x,y1,x,y2)
```

## Настройка координатных осей

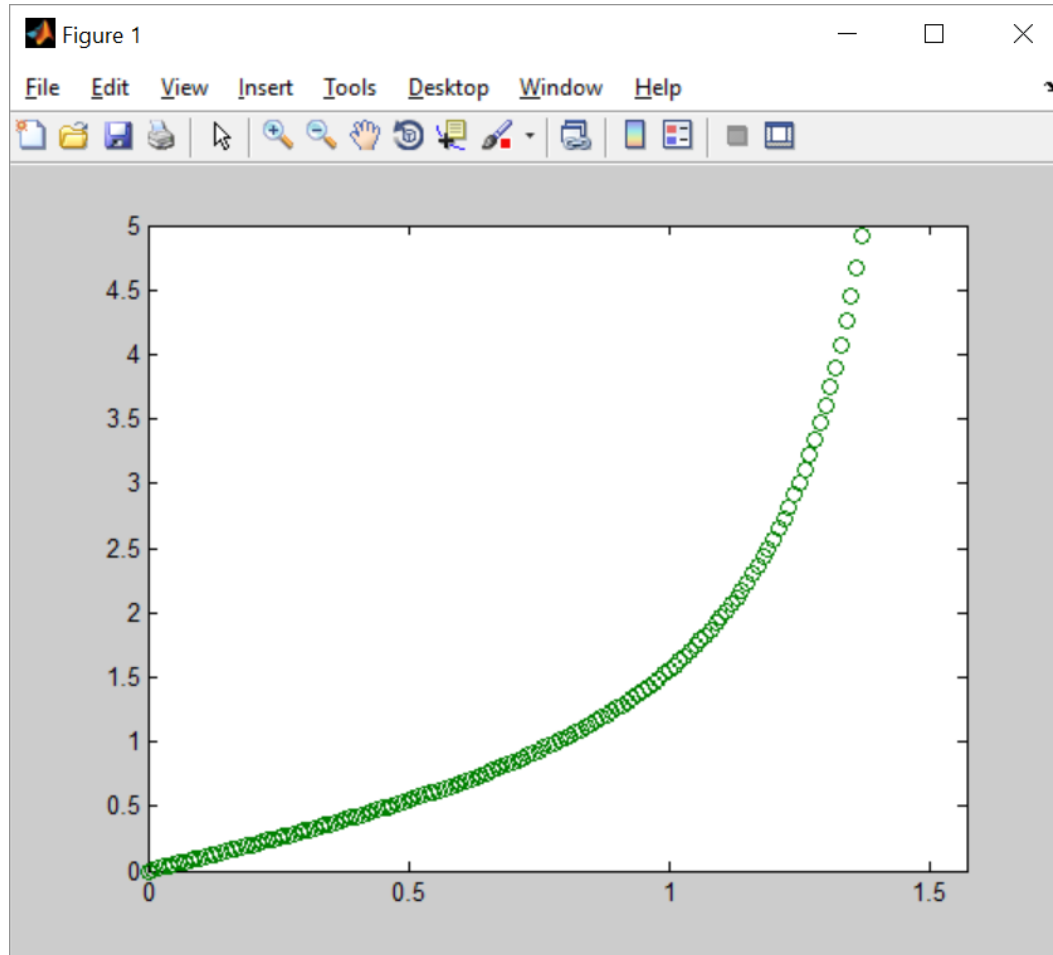
```
>> help graph2d
```

```
Two dimensional graphs.
```

### Axis control.

```
axis          - Control axis scaling and appearance.  
zoom         - Zoom in and out on a 2-D plot.  
grid        - Grid lines.  
box         - Axis box.  
rbbox      - Rubberband box.  
hold       - Hold current graph.  
axes      - Create axes in arbitrary positions.  
subplot  - Create axes in tiled positions.
```

## Построение простейших 2d графиков. **axis**



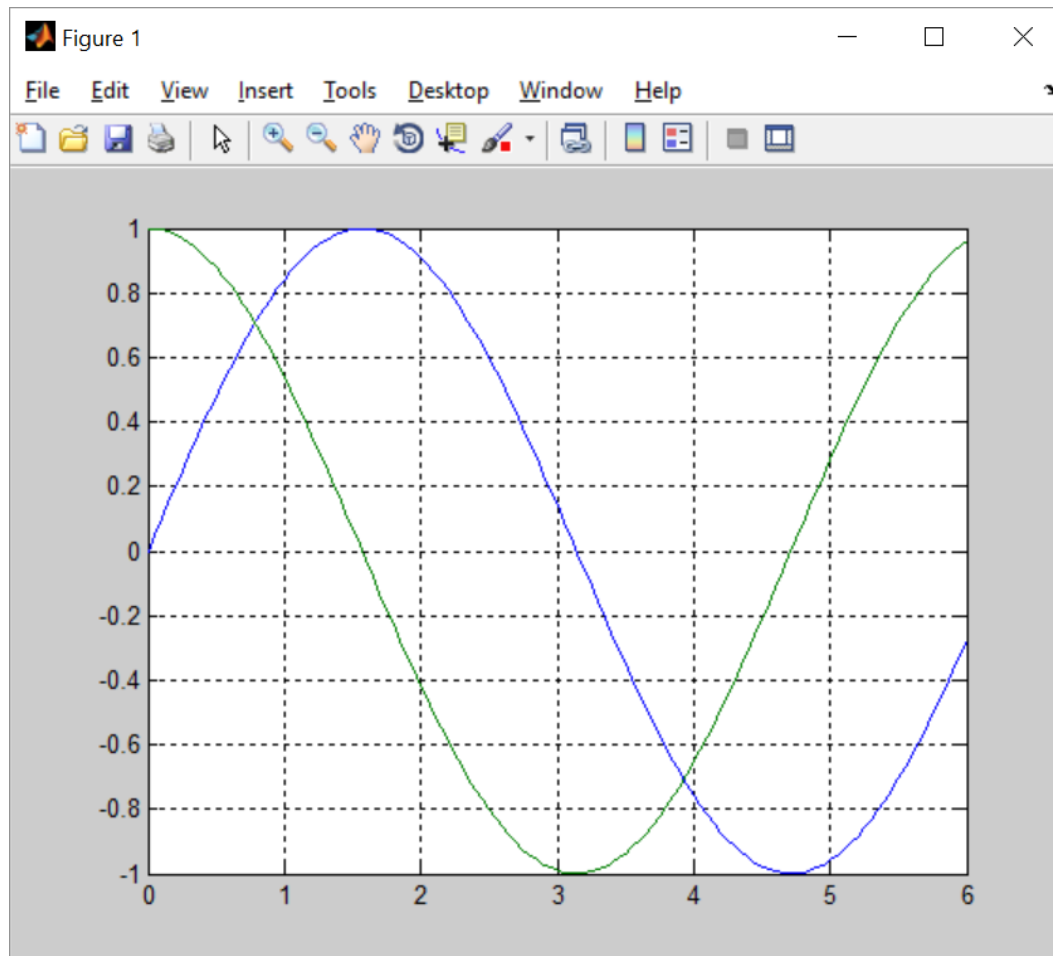
```
x = 0:.01:pi/2;
```

```
y = tan(x);
```

```
plot(x,y,'o')
```

```
axis([0,pi/2,0,5])
```

## Построение простейших 2d графиков. **grid**



```
x=[0:0.05:6] ;
```

```
y1=sin(x)
```

```
y2=cos(x)
```

```
plot(x,y1,x,y2)
```

```
grid on
```

## Построение простейших 2d графиков. **hold**

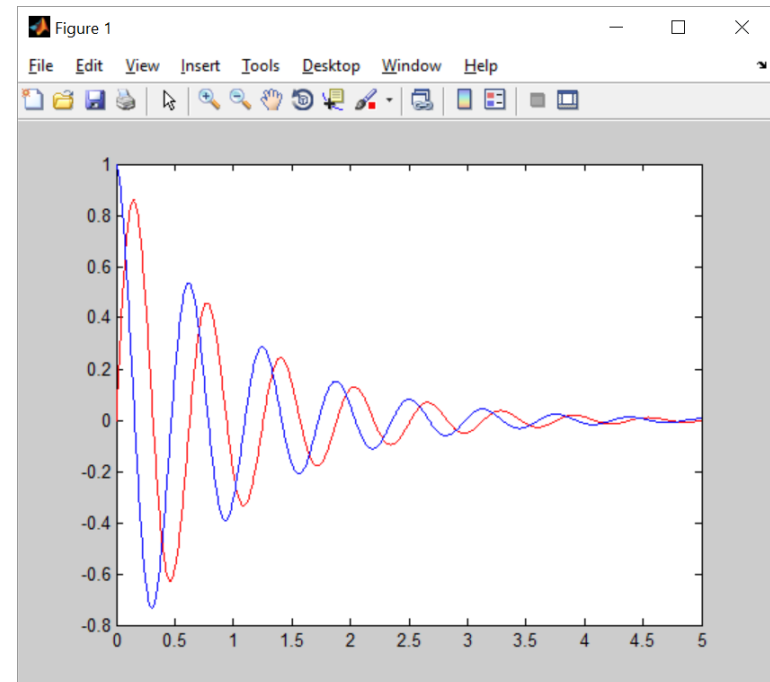
**% Два графика функции в одних осях с помощью hold on**

```
x = [0:0.005:5];  
y1 = exp(-x).*sin(10*x);  
y2 = exp(-x).*cos(10*x);
```

```
% построение первого графика  
plot(x, y1)
```

```
% продолжить в этом же окне  
hold on
```

```
% построение второго графика  
plot(x, y2)
```



## Построение простейших 2d графиков. **axes**

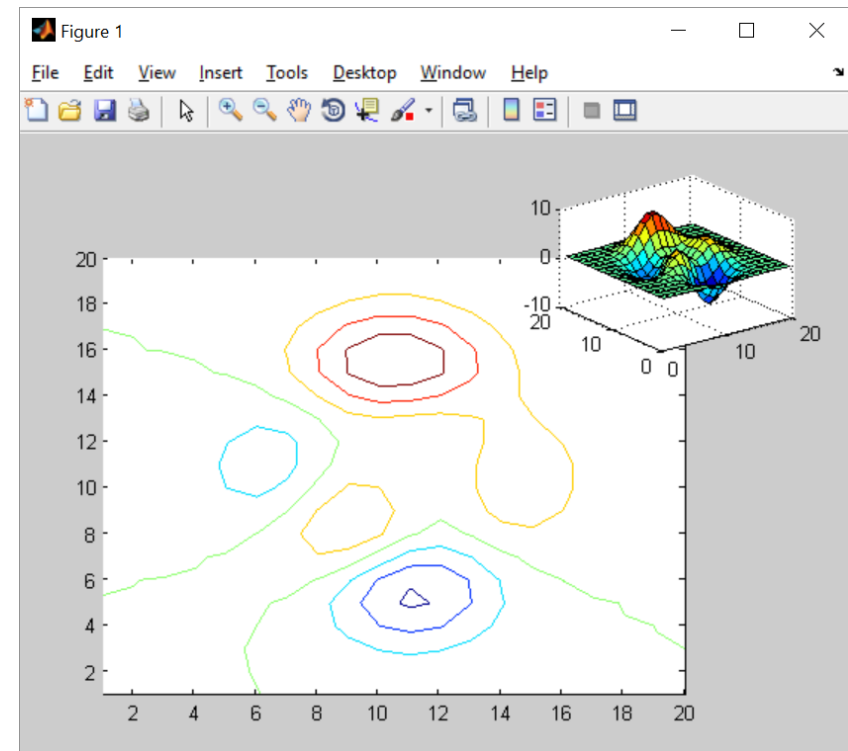
```
figure
```

```
ax1 = axes('Position', [0.1 0.1 0.7 0.7]);
```

```
ax2 = axes('Position', [0.65 0.65 0.28 0.28]);
```

```
contour(ax1, peaks(20))
```

```
surf(ax2, peaks(20))
```

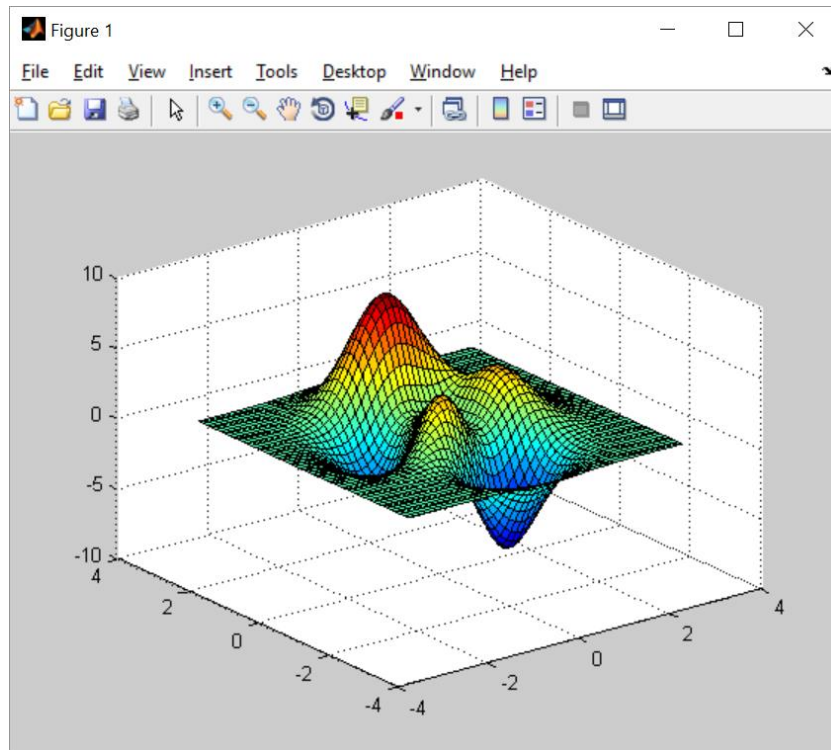


## Построение простейших 2d графиков. **box**

```
[X,Y,Z] = peaks;
```

```
surf(X,Y,Z)
```

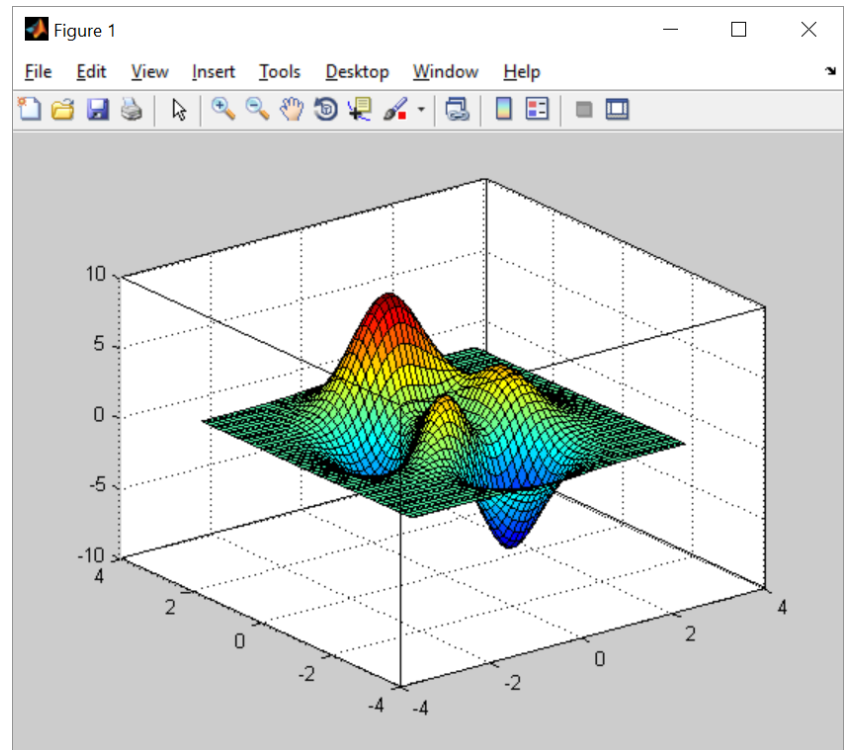
```
box off
```



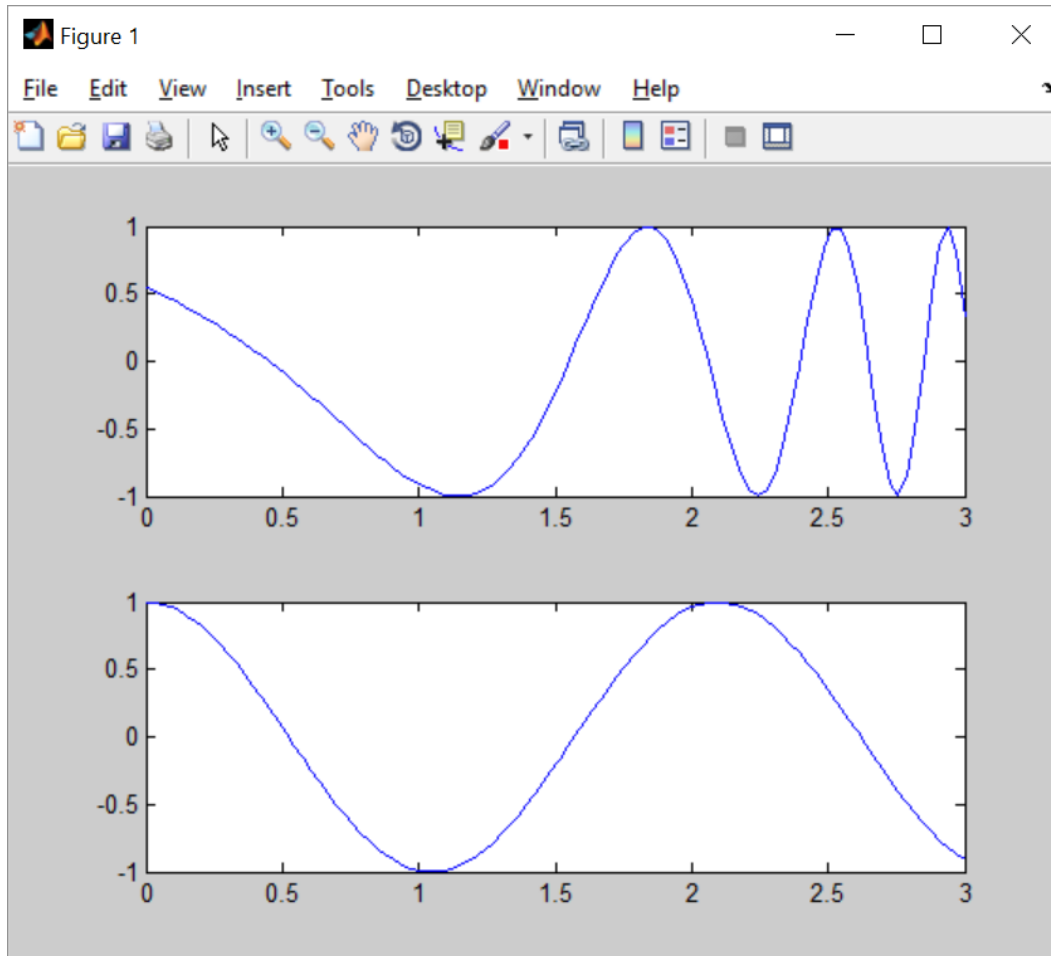
```
[X,Y,Z] = peaks;
```

```
surf(X,Y,Z)
```

```
box on
```



## Построение простейших 2d графиков. **subplot**



```
x = linspace(0,3);
```

```
y1 = cos(exp(x));
```

```
y2 = cos(3*x);
```

```
subplot(2,1,1);
```

```
plot(x,y1)
```

```
subplot(2,1,2);
```

```
plot(x,y2)
```



## Надписи на графиках

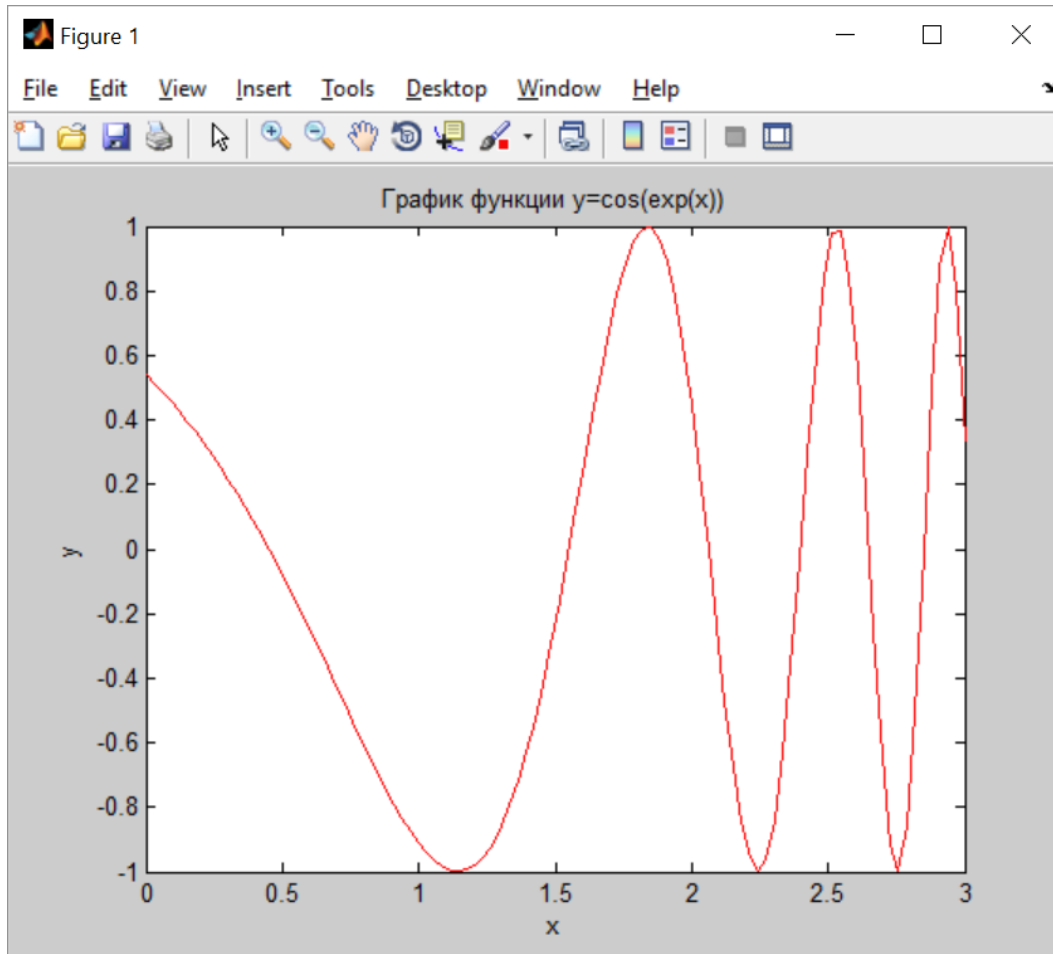
```
>> help graph2d
```

```
Two dimensional graphs.
```

### Graph annotation.

```
    plottedit - Tools for editing and annotating plots.  
title        - Graph title.  
xlabel       - X-axis label.  
ylabel       - Y-axis label.  
texlabel     - Produces the TeX format  
               from a character string.  
text         - Text annotation.  
gtext        - Place text with mouse.
```

## Построение простейших 2d графиков. **title/ xlabel/ ylabel**



```
x = linspace(0,3);  
y = cos(exp(x));  
plot(x,y, 'r-')
```

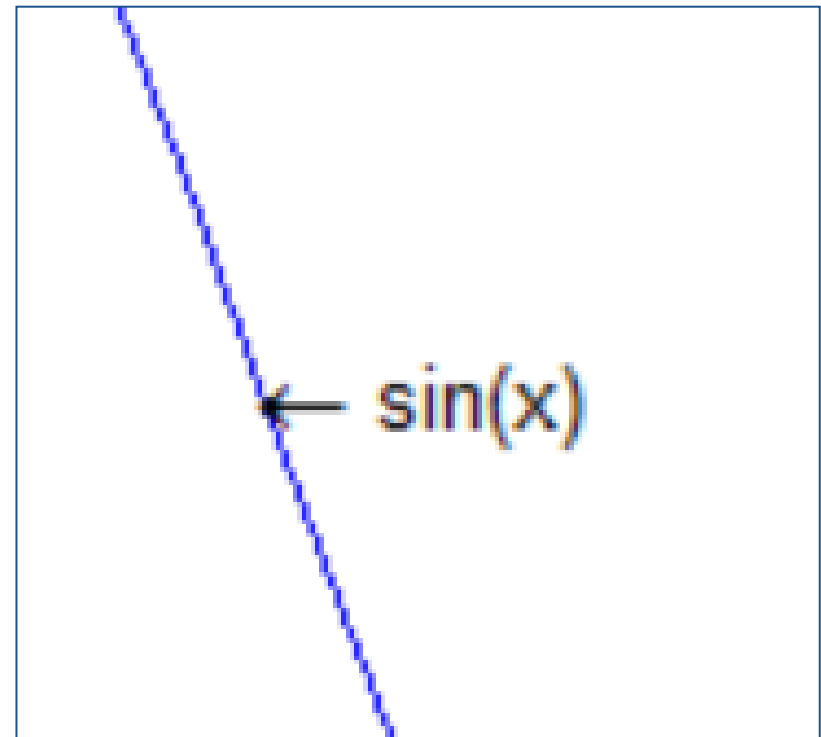
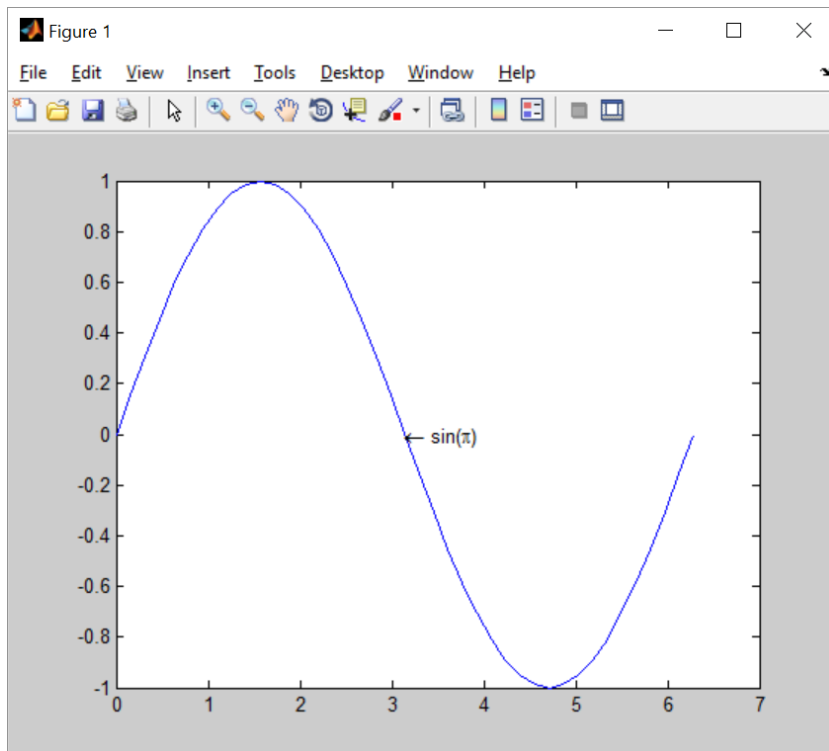
```
title('График  
функции...  
y=cos(exp(x))...  
)
```

```
xlabel('x')
```

```
ylabel('y')
```

## Построение простейших 2d графиков. **text**

```
x = 0:pi/20:2*pi; y = sin(x);  
plot(x,y)  
text(pi,0, '\leftarrow sin(\pi)')
```



## Настройка при печати или сохранении в файл

```
>> help graph2d
```

```
Two dimensional graphs.
```

### Hardcopy and printing.

```
print      - Print graph or Simulink system;  
            or save graph to MATLAB file.  
printopt   - Printer defaults.  
orient     - Set paper orientation.
```

## Трёхмерные графики

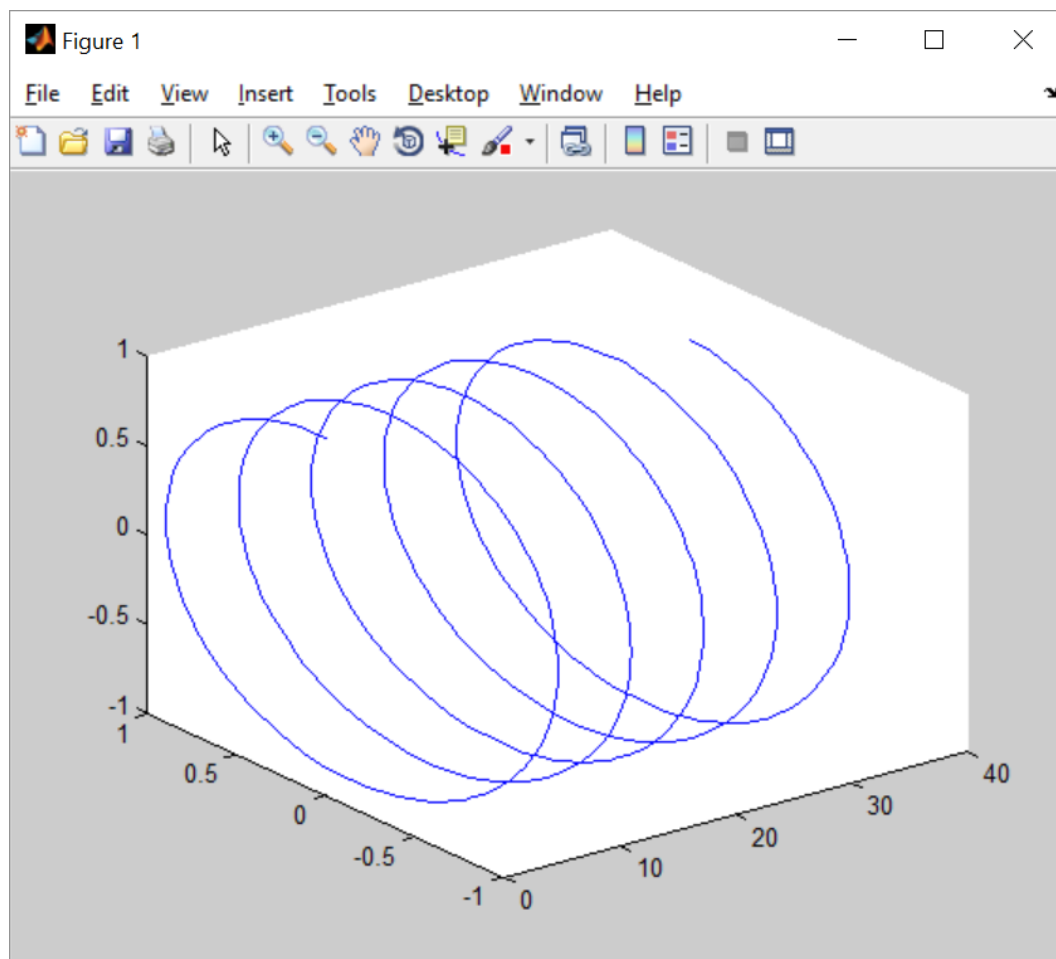
```
>> help graph3d
```

```
Three dimensional graphs.
```

### Elementary 3-D plots.

- `plot3` - Plot lines and points in 3-D space.
- `mesh` - 3-D mesh surface.
- `surf` - 3-D colored surface.
- `fill3` - Filled 3-D polygons.

## Трёхмерные графики. **plot3**



```
a = 0:pi/50:10*pi;
```

```
b = sin(a);
```

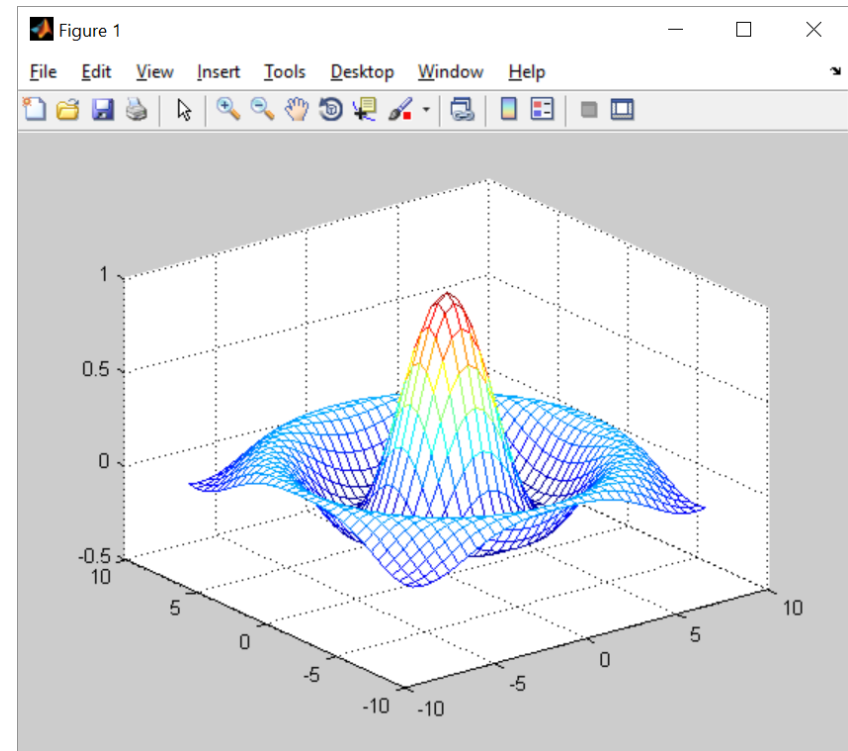
```
c = cos(a);
```

```
figure
```

```
plot3(a,b,c)
```

## Трёхмерные графики. **mesh**

```
[X,Y] = meshgrid(-8:.5:8);  
R = sqrt(X.^2 + Y.^2) + eps;  
Z = sin(R) ./R;  
mesh(X,Y,Z)
```

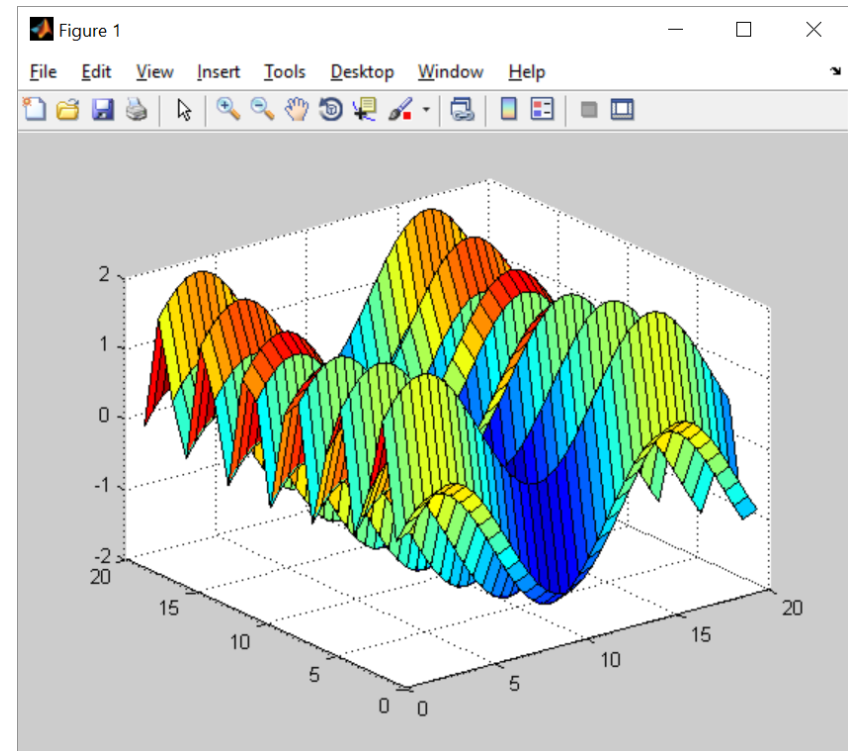


## Трёхмерные графики. **surf**

```
[X,Y] = meshgrid(1:0.5:20,1:20);
```

```
Z = sin(X/2) + cos(2*Y);
```

```
surf(X,Y,Z)
```





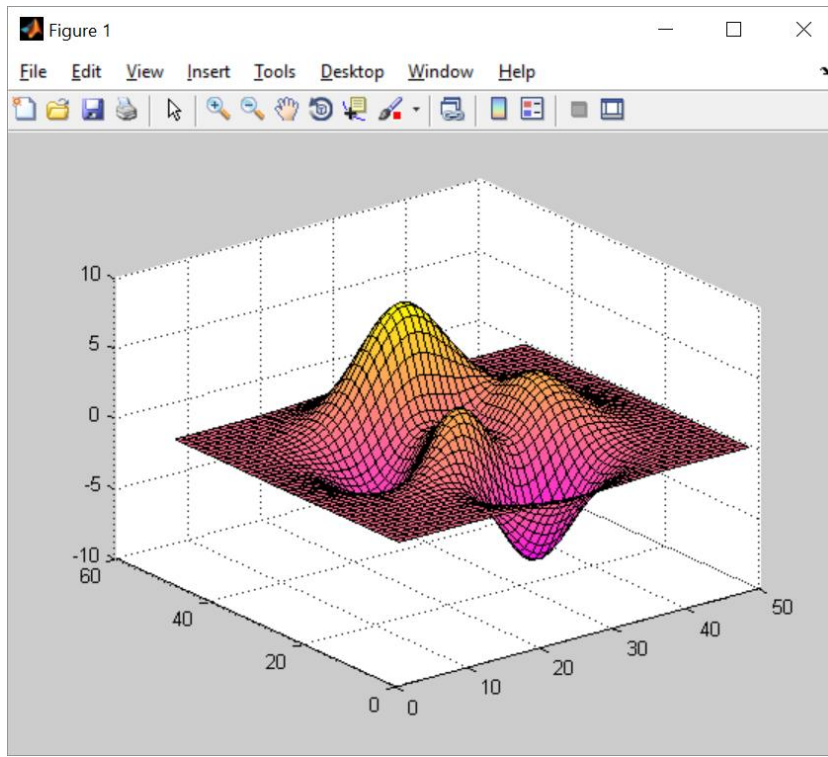
## Трёхмерные графики. Настройка цветов

### Color control.

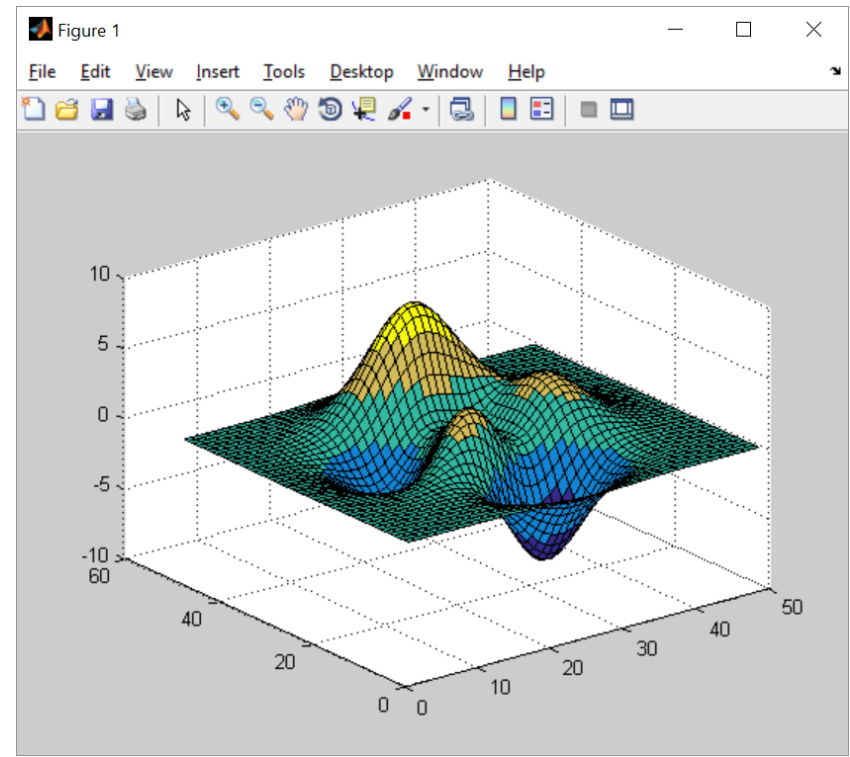
- `colormap` - Color look-up table.
- `caxis` - Pseudocolor axis scaling.
- `shading` - Color shading mode.
- `hidden` - Mesh hidden line removal mode.
- `brighten` - Brighten or darken color map.
- `colordef` - Set color defaults.
- `graymon` - Set graphics defaults for gray-scale monitors.
- `cmpermute` - Rearrange colors in colormap.
- `cmunique` - Eliminate unneeded colors in colormap of indexed image.
- `imapprox` - Approximate indexed image by one with fewer colors.

## Трёхмерные графики. **colormap**

```
surf (peaks)  
colormap (spring)
```



```
surf (peaks)  
colormap (parula (5) )
```



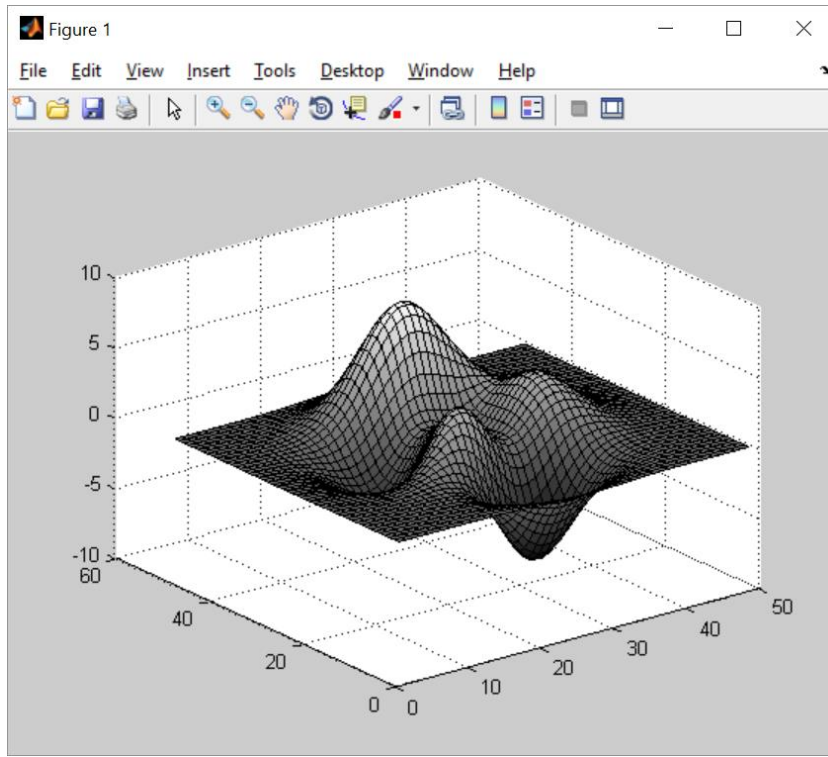
## Трёхмерные графики. Цветовые карты

### Color maps.

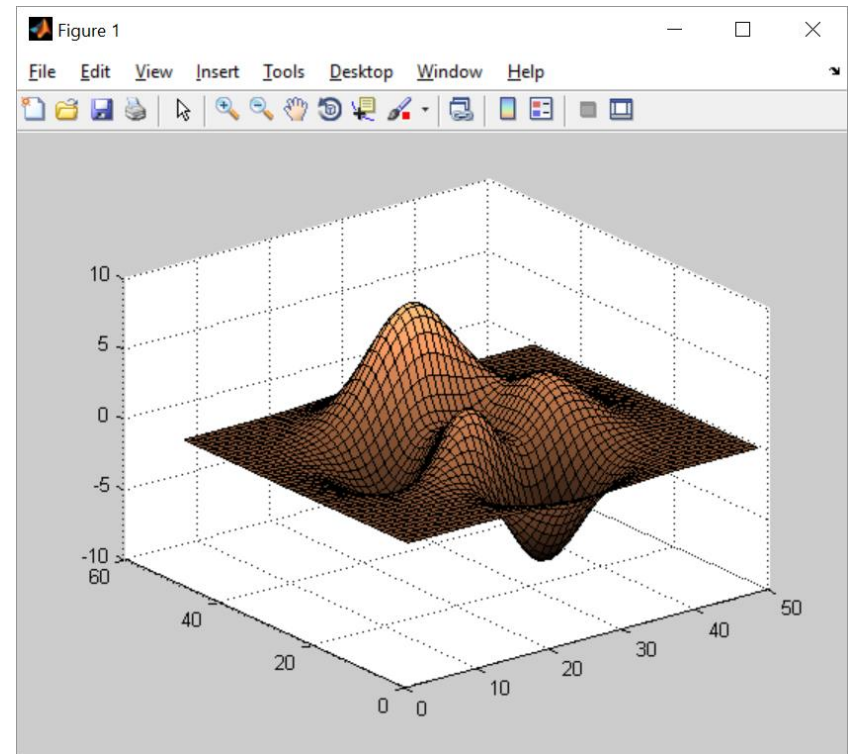
- `hsv` - Hue-saturation-value color map.
- `hot` - Black-red-yellow-white color map.
- `gray` - Linear gray-scale color map.
- `bone` - Gray-scale with tinge of blue color map.
- `copper` - Linear copper-tone color map.
- `pink` - Pastel shades of pink color map.
- `white` - All white color map.
- `flag` - Alternating red, white, blue, and black color map.

## Трёхмерные графики. Color maps

```
surf (peaks) ;  
colormap ('gray') ;
```



```
surf (peaks) ;  
colormap ('copper') ;
```



## Трёхмерные графики. Цветовые карты

### Color maps.

- `lines` - Color map with the line colors.
- `colorcube` - Enhanced color-cube color map.
- `vga` - Windows colormap for 16 colors.
- `jet` - Variant of HSV.
- `prism` - Prism color map.
- `cool` - Shades of cyan and magenta color map.
- `autumn` - Shades of red and yellow color map.
- `spring` - Shades of magenta and yellow color map.
- `winter` - Shades of blue and green color map.
- `summer` - Shades of green and yellow color map.

## Трёхмерные графики

### Lighting.

- `surf1` - 3-D shaded surface with lighting.
- `lighting` - Lighting mode.
- `material` - Material reflectance mode.
- `specular` - Specular reflectance.
- `diffuse` - Diffuse reflectance.
- `surfnorm` - Surface normals.

## Трёхмерные графики. Прозрачность

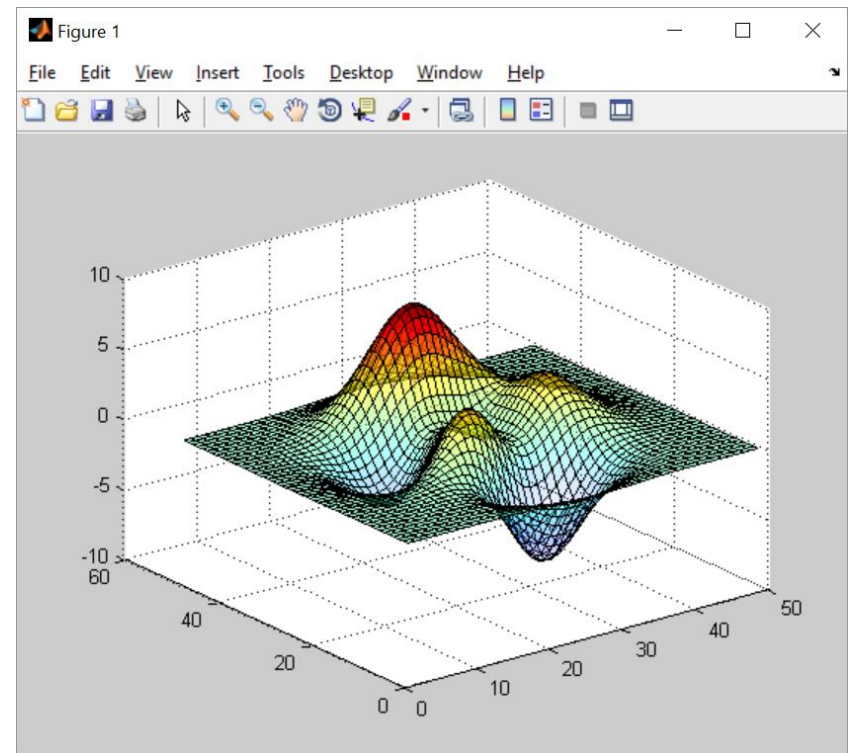
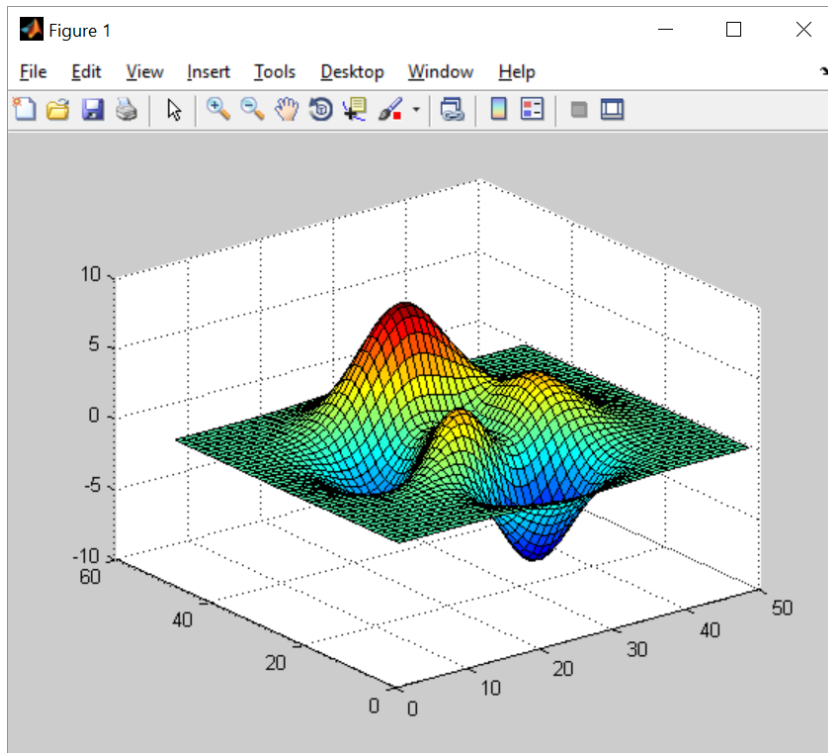
### Transparency.

- `alpha` - Transparency (alpha) mode.
- `alphamap` - Transparency (alpha) look-up table.
- `alim` - Transparency (alpha) scaling

## Трёхмерные графики. **alpha**

```
surf(peaks);
```

```
s = surf(peaks);  
alpha(s, 'z')
```





## Трёхмерные графики. Настройка осей

### Axis control.

<code>axis</code>	- Control axis scaling and appearance.
<code>zoom</code>	- Zoom in and out on a 2-D plot.
<code>grid</code>	- Grid lines.
<code>box</code>	- Axis box.
<code>hold</code>	- Hold current graph.
<code>axes</code>	- Create axes in arbitrary positions.
<code>subplot</code>	- Create axes in tiled positions.
<code>daspect</code>	- Data aspect ratio.
<code>pbaspect</code>	- Plot box aspect ratio.
<code>xlim</code>	- X limits.
<code>ylim</code>	- Y limits.
<code>zlim</code>	- Z limits.

## Трёхмерные графики. Надписи на графиках

### Graph annotation.

- `title` - Graph title.
- `xlabel` - X-axis label.
- `ylabel` - Y-axis label.
- `zlabel` - Z-axis label.
- `text` - Text annotation.
- `gtext` - Mouse placement of text.
- `plottedit` - Experimental graph editing and annotation tools.

## Специальные графики 2d

```
>> help specgraph
```

### Specialized 2-D graphs.

<code>area</code>	- Filled area plot.
<code>bar</code>	- Bar graph.
<code>barh</code>	- Horizontal bar graph.
<code>comet</code>	- Comet-like trajectory.
<code>compass</code>	- Compass plot.
<code>errorbar</code>	- Error bar plot.
<code>ezplot</code>	- Easy to use function plotter.
<code>ezpolar</code>	- Easy to use polar coordinate plotter.
<code>feather</code>	- Feather plot.
<code>fill</code>	- Filled 2-D polygons.

## Специальные графики 2d

```
>> help specgraph
```

**Specialized 2-D graphs.**

<code>fplot</code>	- Plot function.
<code>hist</code>	- Histogram.
<code>pareto</code>	- Pareto chart.
<code>pie</code>	- Pie chart.
<code>plotmatrix</code>	- Scatter plot matrix.
<code>rose</code>	- Angle histogram plot.
<code>scatter</code>	- Scatter plot.
<code>stem</code>	- Discrete sequence or "stem" plot.
<code>stairs</code>	- Stairstep plot.

## Специальные графики 2d

```
>> help specgraph
```

### Contour and 2-1/2 D graphs.

```
contour      - Contour plot.
contourc    - Contour computation.
contourf    - Filled contour plot.
contour3    - 3-D Contour plot.
clabel      - Contour plot elevation labels.
ezcontour   - Easy to use contour plotter.
ezcontourf  - Easy to use filled contour plotter.
pcolor      - Pseudocolor (checkerboard) plot.
voronoi     - Voronoi diagram.
```

## Специальные графики 3d

```
>> help specgraph
```

**Specialized 3-D graphs.**

```
bar3          - 3-D bar graph.
bar3h         - Horizontal 3-D bar graph.
comet3        - 3-D comet-like trajectories.
ezgraph3      - General purpose surface plotter.
ezmesh        - Easy to use 3-D mesh plotter.
ezmeshc       - Easy to use combination
                mesh/contour plotter.
ezplot3       - Easy to use 3-D parametric
                curve plotter.
```

## Специальные графики 3d

```
>> help specgraph
```

**Specialized 3-D graphs.**

- `ezsurf` - Easy to use 3-D colored surface plotter.
- `ezsurfz` - Easy to use combination surf/contour plotter.
- `meshc` - Combination mesh/contour plot.
- `meshz` - 3-D mesh with curtain.
- `pie3` - 3-D pie chart.
- `ribbon` - Draw 2-D lines as ribbons in 3-D.
- `scatter3` - 3-D scatter plot.
- `stem3` - 3-D stem plot.

## Специальные графики 3d

```
>> help specgraph
```

**Specialized 3-D graphs.**

<code>surfc</code>	- Combination surf/contour plot.
<code>trisurf</code>	- Triangular surface plot.
<code>trimesh</code>	- Triangular mesh plot.
<code>waterfall</code>	- Waterfall plot.





Спасибо за внимание!